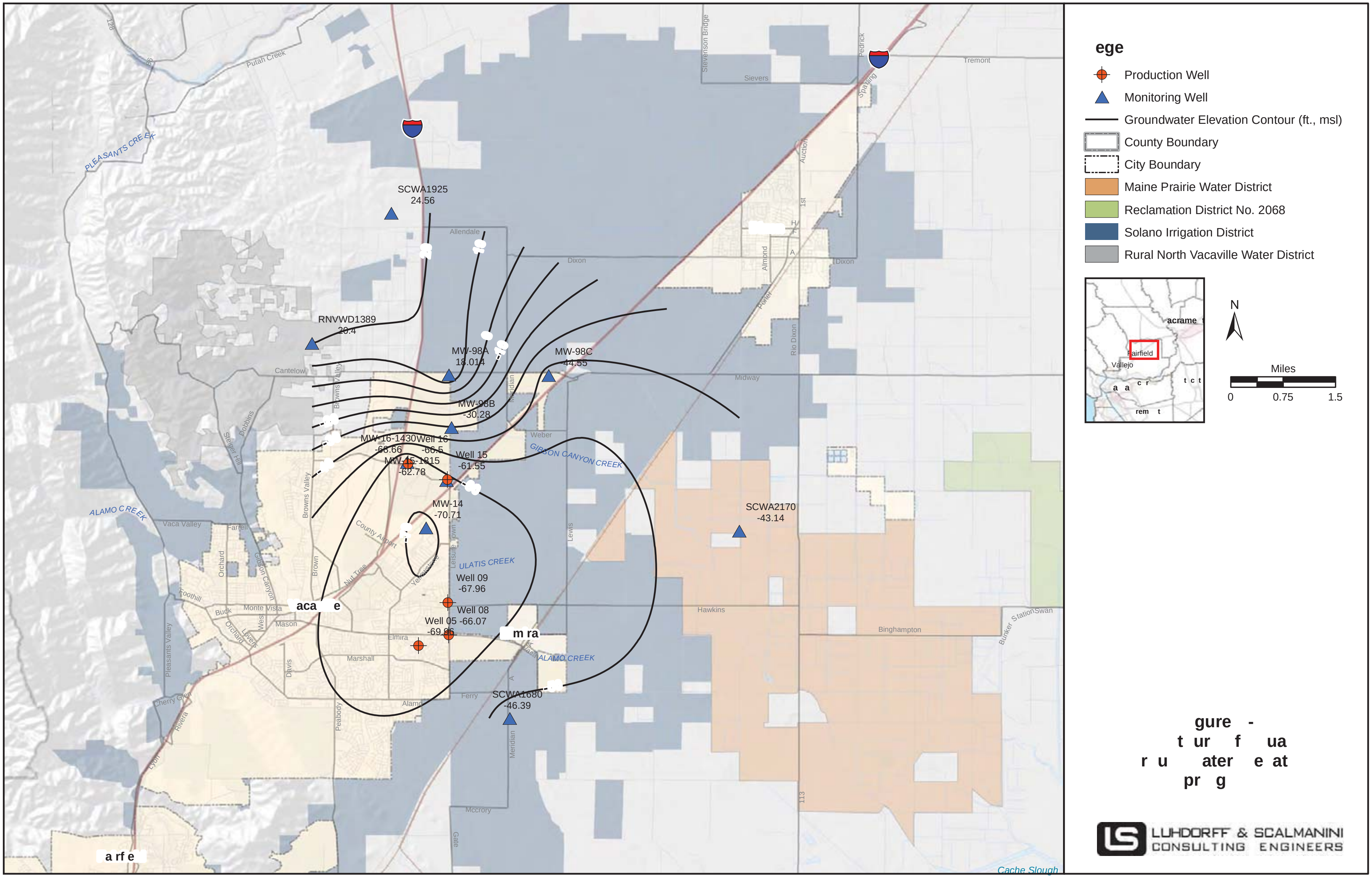


File: Y:\Casey_Meirovitz\10-1-124 Vacaville GWMP Update\Report\GIS\Figure A-7 WL Contours Spring 2009.mxd Date: 12/9/2010

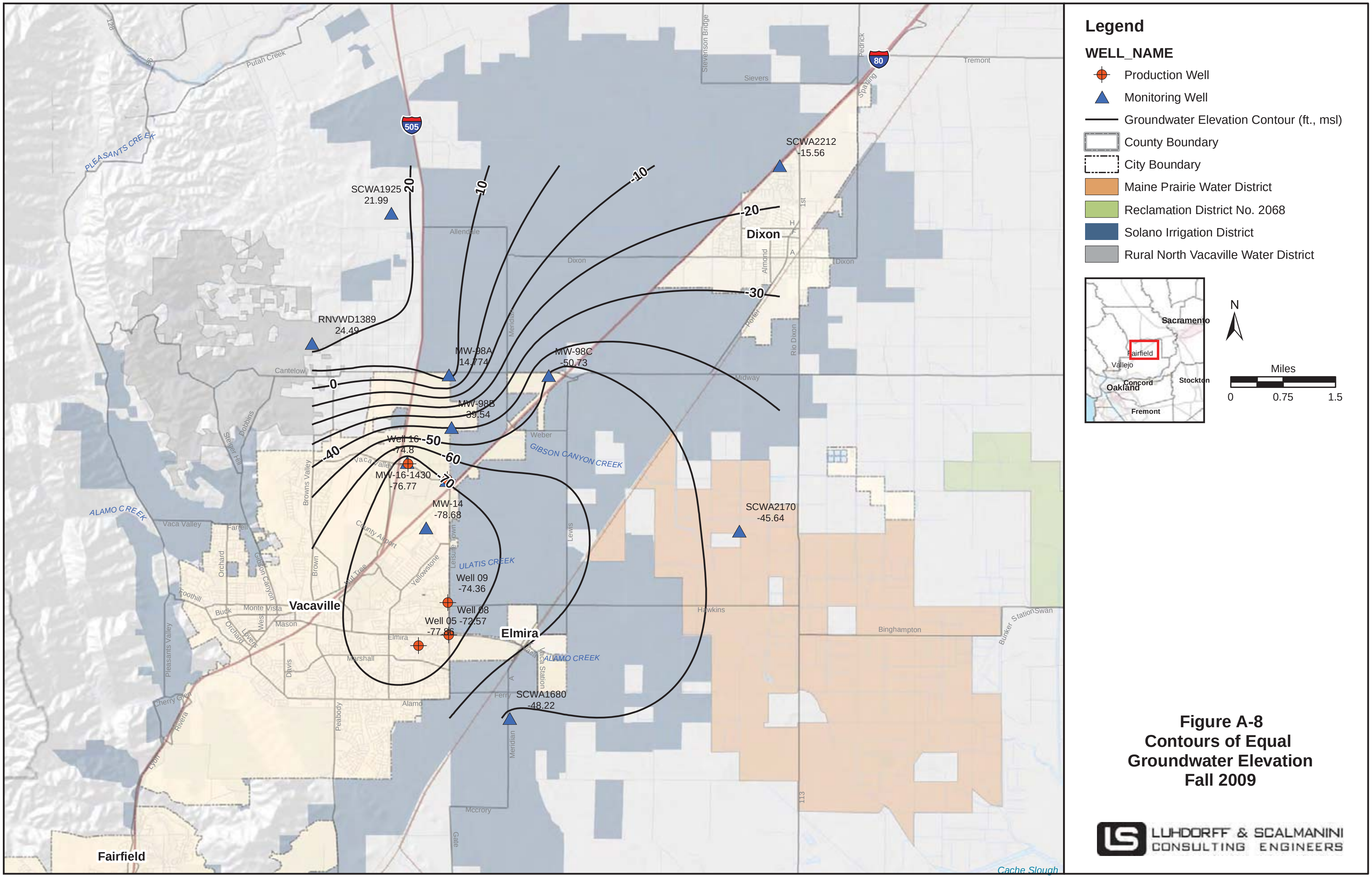


Figure A-8
Contours of Equal
Groundwater Elevation
Fall 2009

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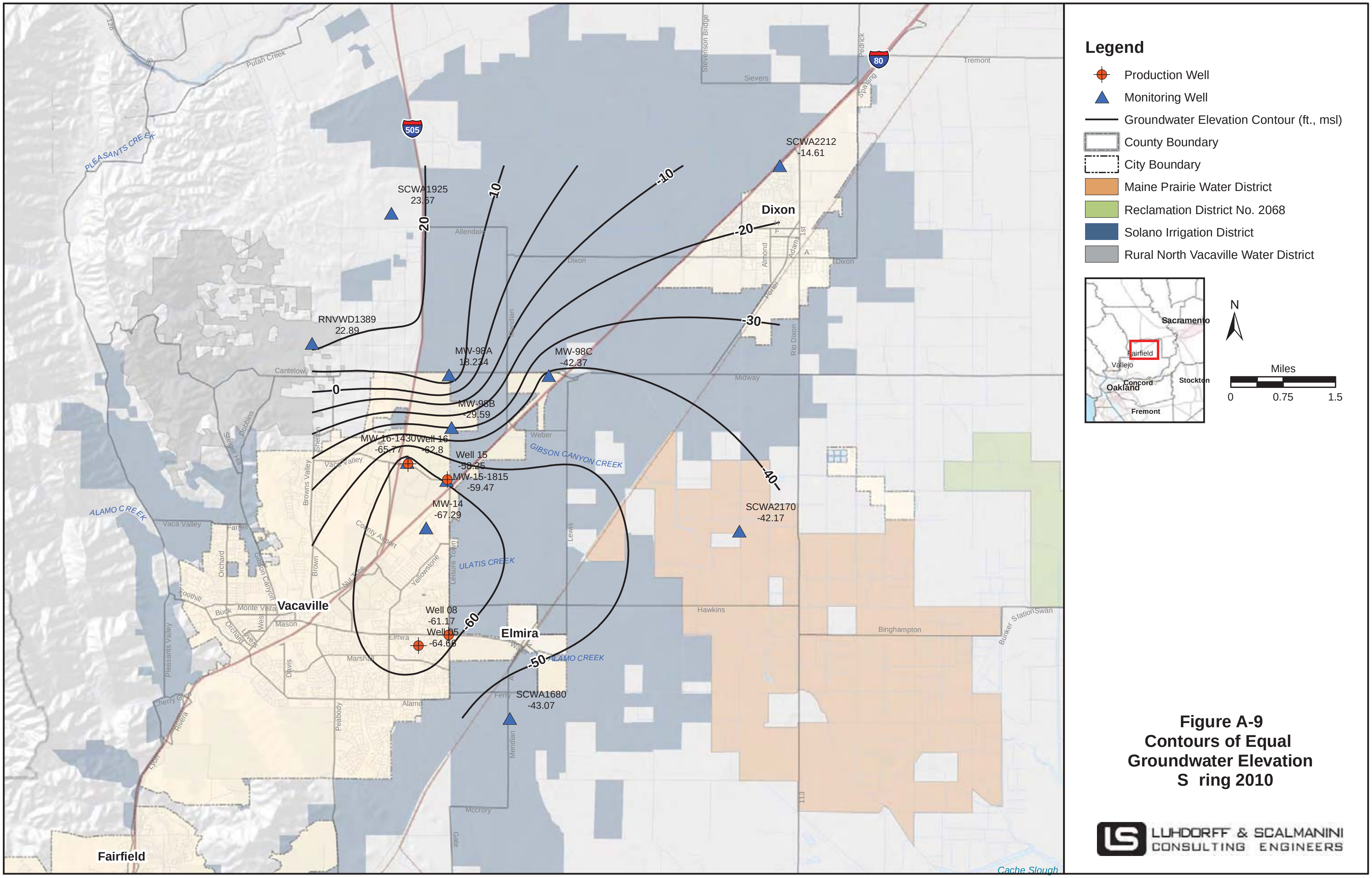


**Figure A-9**
**Contours of Equal Groundwater Elevation**
**S ring 2010**

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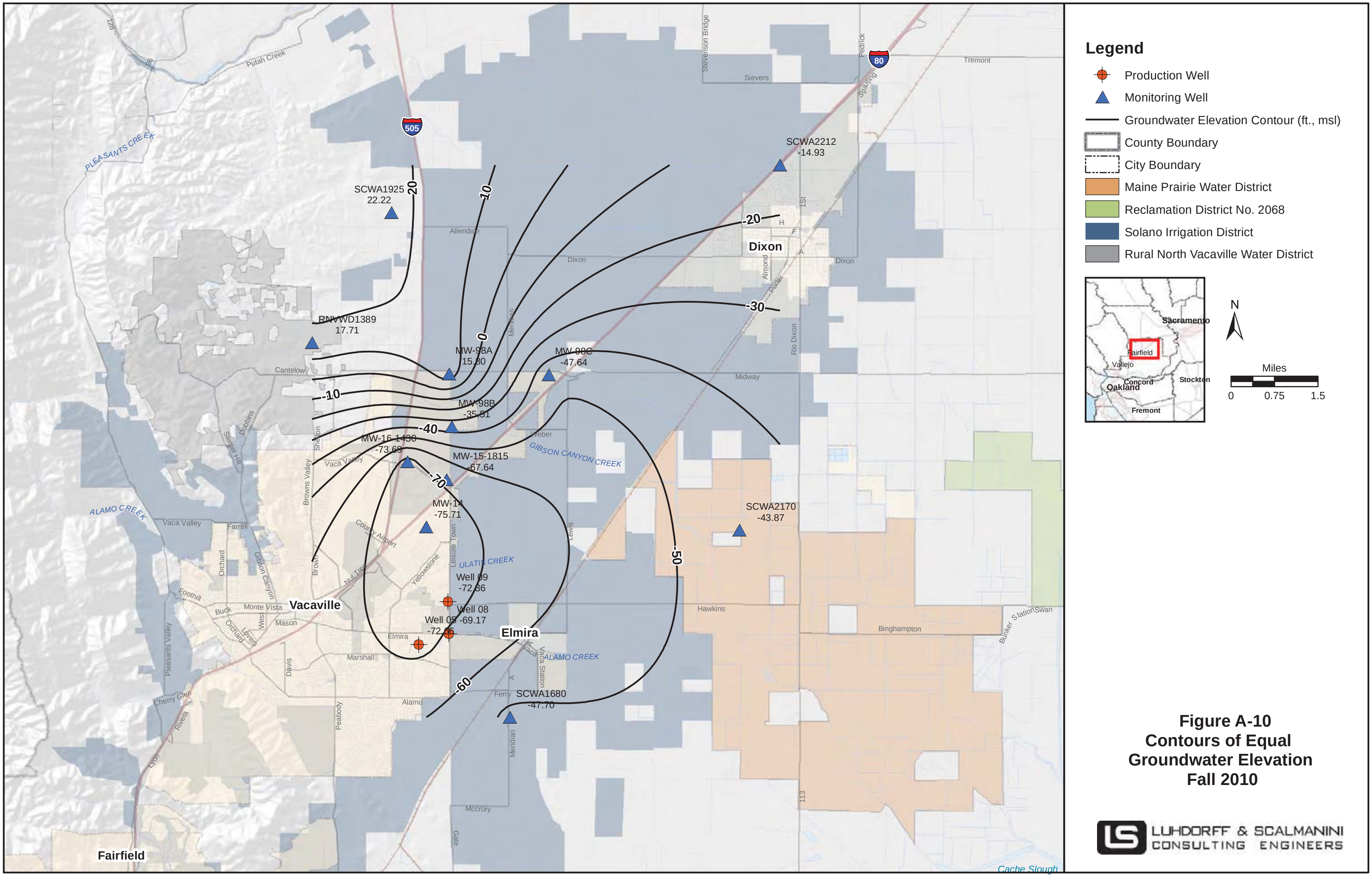


## Figure A-10
## Contours of Equal Groundwater Elevation
## Fall 2010

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File: Y:\Casey_Meirovitz\10-1-124 Vacaville GWMP Update\Report\GIS\Figure A-10 WL Contours Fall 2010.mxd Date: 12/9/2010

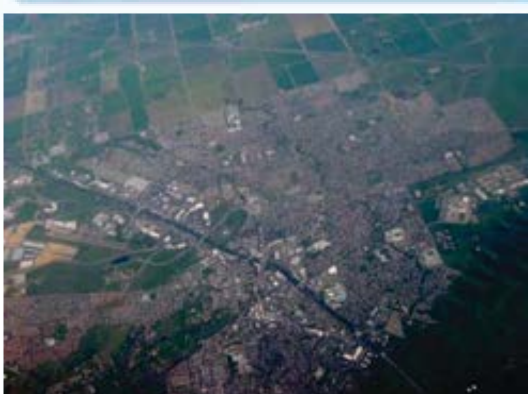
# APPENDIX C

# GROUNDWATER SOURCE SUFFICIENCY TECHNICAL MEMORANDUM, MAY 2016

Technical Memorandum

# GROUNDWATER SUPPLY SUFFICIENCY

May 2016

*Prepared for*

City of Vacaville

*Prepared by*

Luhdorff & Scalmanini,
Consulting Engineers

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

# Technical Memorandum

# *Groundwater Supply Sufficiency*

*Prepared for*

City of Vacaville

*May 2016*

*Prepared by*

Luhdorff & Scalmanini, Consulting Engineers

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Job No. 15-1-116

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# 1 INTRODUCTION

## 1.1 CITY'S GROUNDWATER UTILIZATION

This Technical Memorandum describes the use and sufficiency of groundwater supplies beneath the City of Vacaville and vicinity to meet the City's historical and projected groundwater demands. This Memorandum summarizes subsurface hydrogeologic conditions and describes the City's approach to managing groundwater resources. This Memorandum also describes the sufficiency of groundwater pumped for the past 5 years and planned utilization of groundwater resources for a more than 20-year planning horizon (through 2040), including results of a groundwater flow model and the estimated pumpage for the principal aquifer in the northern Solano County area.

This Memorandum has been prepared in support of the City's *2015 Urban Water Management Plan Update* (City of Vacaville, 2016).

### 1.1.1 City Water Supplies

The City of Vacaville is located at the base of the Vaca Mountains, approximately halfway between Sacramento and San Francisco on Interstate 80 (**Figure 1-1**). Water demand has increased as the City's population grew from about 43,400 in 1980 to 71,500 in 1990, 92,000 in 2009, and almost 94,000 in 2014.

The City's water utility system was purchased from the Pacific Gas and Electric Company in 1959 by issuing voter-approved water revenue bonds (Nolte, 2005). Since that time, the City has systematically improved and upgraded the water utility system. Today, the City's system consists of transmission and distribution pipelines, storage reservoirs, wells, pumping facilities, and water treatment facilities. The system receives water from several sources, including Solano Project water from the Lake Berryessa Reservoir, State Water Project (SWP) water and Settlement Water from the North Bay Aqueduct (NBA), and groundwater from local City wells. The percentage of water used from each supply source varies due to the City's conjunctive management of its water resources. Prior to completion of the Solano Project, all water supplies provided for municipal purposes were developed from local groundwater. The City has received Solano Project water through an agreement with SCWA since 1959.

Some of the Solano Project and SWP water supply is based on the City's entitlement and some is based on other agreements and settlements. The City's surface water entitlements for 2015 totaled 27,173 acre-feet (AF). SWP deliveries are less than the entitlement in all but the wettest years. The availability of SWP water is approximately 83% of the entitlement in a normal year and is projected to decrease to 22% in a single-dry year and to 27% in a multiple-dry year. Surface water supplies are detailed in the technical memorandum "SCWA Water Supply Reliability Technical Memorandum" (Kennedy/Jenks Consultants, April 14, 2016).

The 2003 Recycled Water Plan will be updated in the next two years and is expected to provide future recycled water quantities that will be included in the 2020 UWMP update, there is no data at this time to support a volume projection in this 2015 UWMP (personal communication, Christina Castro, City of Vacaville, March 18, 2016).

In aggregate, the estimated water resources available to the City in the year 2040 total 42,198 AF, including about 8,100 AF of groundwater (about 20% of the total supply) during normal water years and more groundwater during drier years. Historically, the City has generally used less than 8,000 AFY of groundwater.

### 1.1.2 Groundwater Supply Sufficiency

With regard to the demonstration of groundwater supply sufficiency and reliability for purposes of Urban Water Management Plans (UWMPs), the California Water Code, Section 10631(b)(3) requires the water supplier to provide a “detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years.” Water Code Section 10631(4)(c) further requires that the City “describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year.
(B) A single-dry water year.
(C) Multiple-dry water years.

A “sufficient water supply” is defined in Government Code 66473.7 as “the total water supplies available during the normal, single-dry, and multiple-dry years within a 20-year projection that will meet the projected demand associated with the proposed subdivisions, in addition to existing and planned future uses, including, but not limited to, agricultural and industrial uses.” The California Water Code Section 10644 also requires updating of the UWMP, including provisions relating to groundwater as part of the City’s water supply.

Although three water year terms (normal, single-dry and multiple-dry years) are identified in Government Code 66473.7, definitions for these water years are not included in the Code. However, the “2015 Urban Water Management Plans Guidebook for Urban Water Suppliers” (March 2016, California Department of Water Resources) defines the types of years:

> ***Average (Normal) year***: A year, or an averaged range of years, that most closely represents the average water supply available to the agency. The UWMP Act uses the term “normal” conditions. The terms “normal” and “average” are used interchangeably within the guidebook.
>
> ***Single-Dry Year***: The single-dry year is the year that represents the lowest water supply available to the agency.
>
> ***Multiple-Dry Years***: The multiple dry year period is the period that represents the lowest average water supply availability to the agency for a consecutive multiple year period (three years or more). This is generally considered to be the lowest average runoff for a consecutive multiple year period (three years or more) for a watershed since 1903. DWR has interpreted “multiple dry years” to mean three dry years, however, water agencies may project their water supplies for a longer time period.

Water Code Section 10631(b)(1) specifies that a copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750) be supplied with the UWMP. The City recently adopted its *Groundwater Management Plan Update* (LSCE, 2011). This Memorandum summarizes information on hydrogeologic conditions, including the description of the groundwater basins from which the City of Vacaville pumps groundwater, along with an analysis of the City's historical use of groundwater and the groundwater levels observed in response to City and other pumpage in the northern Solano County area. This Memorandum also provides a summary of previous work performed to estimate the potentially sustainable level of annual pumpage.

This previous work involves an analytical groundwater model that was developed to simulate the response of the principal aquifer used by the City for meeting municipal demands under various pumping scenarios through the year 2035, including a climate-based scenario to evaluate increased pumpage during drier water years (e.g., single-dry year and/or multiple-dry water years). This Memorandum contains a summary of this modeling work and more details in Appendix B.

Finally, this Memorandum describes the groundwater monitoring data that will continue to be collected and used to evaluate future pumpage sustainability based on the criteria discussed below.

### 1.1.3 Memorandum Outline

This Memorandum summarizes the analyses necessary to address the groundwater supply sufficiency and reliability portions of the UWMP requirements, including:

- A summary of the geologic setting and groundwater basin;
- A summary of the City's historical and projected pumpage;
- A summary of groundwater conditions, including the hydrogeology of major water-producing units underlying the City;
- A summary of groundwater levels in and around the City;
- A summary of groundwater quality for major chemical constituents;
- A summary of land subsidence in and around the City; and
- A summary of the groundwater supply sufficiency for 2020-2040.

# 2 SUMMARY OF CITY WATER SUPPLIES AND GROUNDWATER CONDITIONS

## 2.1 GROUNDWATER BASIN DESCRIPTIONS

As shown on **Figure 2-1**, the City of Vacaville overlies portions of two DWR-designated groundwater basins. The City primarily overlies the northwestern portion of the Solano Subbasin, which is one of 18 subbasins in the Sacramento Valley Basin of the Sacramento River Hydrologic Region. A small area in the southern portion of the City overlies the Suisun-Fairfield Valley Basin in the San Francisco Bay Hydrologic Region. The western portion of the City, west of the Solano Subbasin boundary, is located in the Sacramento River Hydrologic Study Area but does not overlie any area currently designated by DWR as a groundwater basin or subbasin (**Figure 2-1**).

All of the City's existing and proposed municipal wells are located in the Solano Subbasin. **Figure 2-2** shows the other major purveyors in the northern portion of the subbasin. These include the City of Dixon, SID, Rural North Vacaville Water District (RNVWD), Maine Prairie Water District (MPWD), and Reclamation District 2068 (RD 2068). Descriptions of the Solano Subbasin and the Suisun-Fairfield Valley Basin are provided below. These descriptions are partly based on the information contained in *California's Groundwater, Bulletin 118 Update 2003* (DWR, 2003). For the Solano Subbasin, a more detailed groundwater basin description is posted on the DWR web site (DWR, 2016).

### 2.1.1 Sacramento Valley Basin, Solano Subbasin (Basin Number: 5-21.66)

The Solano Subbasin includes the southernmost portion of the Sacramento Valley Basin and extends into the northern portion of the Sacramento-San Joaquin Delta. Overall, population density within the subbasin is sparse, with the major cities being Vacaville, Dixon, and Rio Vista. Subbasin boundaries are defined by Putah Creek on the north, the Sacramento River on the east (from Sacramento to Walnut Grove), the North Mokelumne River on the southeast (from Walnut Grove to the San Joaquin River), and the San Joaquin River on the south (from the North Mokelumne River to the Sacramento River). The western subbasin boundary, which extends through a portion of the City, is partly defined by the groundwater divide between the San Francisco Bay and Sacramento River Hydrologic Regions as described by DWR (2010). DWR reports that the location of the divide is roughly delineated by the English Hills (a section of the Coast Range south of Putah Creek and north of Vacaville) and the Montezuma Hills. There is an area west of the Solano Subbasin between the subbasin boundary and the Lagoon Valley/Vaca Valley fault in which some groundwater development has occurred, but which does not lie within a designated basin or subbasin area.

### 2.1.2 Suisun-Fairfield Valley Basin (Basin Number: 2-3)

The Suisun-Fairfield Valley Basin is composed of low alluvial plains, with surrounding foothills and mountains, located immediately north of Suisun Bay. The foothills of the Coast Ranges, lying west of Green Valley, bound the basin on the west. The southern extent of the Vaca Mountains forms the northern boundary of the basin. The eastern extent of the basin is marked by low ridges of consolidated rock that appear near the City and extend southeast to the Montezuma Hills (Thomasson et al, 1960).

## 2.2 CITY OF VACAVILLE GROUNDWATER

Prior to 1997, all City pumpage was from the Elmira Road well field, primarily from wells completed in the basal zone of the Tehama Formation but also including a small amount of pumpage from City Well 1 completed in the Markley Formation. Concentrated pumpage in the Elmira Road area caused a localized cone of depression and declining groundwater levels in the basal zone. In order to alleviate this condition, the City began constructing new wells outside of the Elmira Road area in the mid-1990s. Beginning with the construction of Well 14, which came on line in 1997, some pumpage has been redistributed from Elmira Road to the northeastern portion of the City. Two other northeast sector wells have since been constructed in the basal zone. Well 15 came on line in 2004, and Well 16 came on line in 2007. The northeast sector wells produced almost 2,200 AF (40-42% of the total) in 2014 and 2015. The locations of existing City wells are shown on **Figure 2-3**.

The majority of the City's historical and current pumpage is from the basal zone of the Tehama Formation; Well 1 is the only non-basal zone well currently in operation. Total annual pumpage for the City from 1968 to 2015 is shown on **Figure 2-4** and **Table 2-1**. Annual pumpage from the City's wells is divided into four categories on **Figure 2-4**:

1) Basal zone pumpage from the Elmira Road well field (Wells 2 through 13);
2) Non-basal zone pumpage from Well 1 at Elmira Road (currently less than 100 AF per year);
3) Basal zone pumpage from northeast sector wells (currently Wells 14, 15, and 16);
4) Non-basal zone pumpage from the DeMello well in the northeast sector (maximum of 160 AF per year in 2003, offline as of 2005).

The City's annual groundwater pumpage was relatively constant from 1968 to 1974, ranging from 2,862 to 3,316 AF per year. All pumpage during this period was from Elmira Road wells but was not differentiated by zone. Pumpage began to increase in 1975 and reached a peak of 8,165 AF in 1983. Pumpage decreased to 6,088 AF in 1984 and ranged from 5,421 to 6,236 AF, with an average of about 5,800 AF, during 1984 to 1992. Pumpage decreased to 4,395 AF in 1993 and continued to decrease to a low of 3,230 AF in 1996. Pumpage increased from1996 to 2002, reaching 6,638 AF in 2002. From 2002 to 2007 pumping remained relatively constant, averaging 6,635 AF per year. Since 2007, the City of Vacaville has reduced the amount of groundwater it produces to 5,222 AF in 2015, which represents 40% of total water used (13,204 AF[1]) for that year. Water demand supplied by groundwater was 34% in 2007 and 31% in 2010.

[1] The actual volume of water supplies for 2015 was 13,204 AFY according to Table 6-8 Retail: Water Supplies – Actual, which lists the Solano Project Water at 6,214 AFY; State Project Water at 1,769 AFY; and groundwater at 5,222 AFY.

**Table 2-1**
**City of Vacaville Annual Well Production (acre feet)**

| Year | Elmira Road | | | Northeast Sector | | | All Wells | | |
|---|---|---|---|---|---|---|---|---|---|
| | Basal Zone (Wells 2-13) | Non-Basal Zone (Well 1) | Total | Basal Zone (Wells 14-16) | Non-Basal Zone (DeMello) | Total | Basal Zone (Wells 2-16) | Non-Basal Zone (Well 1 & DeMello) | Total |
| 1968 | | | | | | | | | 2862 |
| 1969 | | | | | | | | | 3046 |
| 1970 | | | | | | | | | 2871 |
| 1971 | | | | | | | | | 3198 |
| 1972 | | | | | | | | | 3255 |
| 1973 | | | | | | | | | 3125 |
| 1974 | 2,870 | 446 | 3,316 | | | | 2,870 | 446 | 3,316 |
| 1975 | 3,492 | 478 | 3,970 | | | | 3,492 | 478 | 3,970 |
| 1976 | 4,525 | 440 | 4,965 | | | | 4,525 | 440 | 4,965 |
| 1977 | 4,724 | 368 | 5,092 | | | | 4,724 | 368 | 5,092 |
| 1978 | 5,300 | 407 | 5,707 | | | | 5,300 | 407 | 5,707 |
| 1979 | 5,858 | 327 | 6,185 | | | | 5,858 | 327 | 6,185 |
| 1980 | 6,594 | 395 | 6,989 | | | | 6,594 | 395 | 6,989 |
| 1981 | 7,540 | 200 | 7,740 | | | | 7,540 | 200 | 7,740 |
| 1982 | 7,428 | 254 | 7,682 | | | | 7,428 | 254 | 7,682 |
| 1983 | 7,892 | 273 | 8,165 | | | | 7,892 | 273 | 8,165 |
| 1984 | 6,066 | 22 | 6,088 | | | | 6,066 | 22 | 6,088 |
| 1985 | 5,709 | 144 | 5,854 | | | | 5,709 | 144 | 5,854 |
| 1986 | 5,594 | 229 | 5,823 | | | | 5,594 | 229 | 5,823 |
| 1987 | 6,085 | 151 | 6,236 | | | | 6,085 | 151 | 6,236 |
| 1988 | 5,291 | 129 | 5,420 | | | | 5,291 | 129 | 5,420 |
| 1989 | 5,919 | 153 | 6,072 | | | | 5,919 | 153 | 6,072 |
| 1990 | 5,520 | 106 | 5,626 | | | | 5,520 | 106 | 5,626 |
| 1991 | 5,298 | 149 | 5,447 | | | | 5,298 | 149 | 5,447 |
| 1992 | 5,405 | 126 | 5,531 | | | | 5,405 | 126 | 5,531 |
| 1993 | 4,395 | 0 | 4,395 | | | | 4,395 | 0 | 4,395 |
| 1994 | 3,888 | 4 | 3,892 | | | | 3,888 | 4 | 3,892 |
| 1995 | 3,856 | 30 | 3,885 | | | | 3,856 | 30 | 3,885 |
| 1996 | 3,128 | 102 | 3,230 | | | | 3,128 | 102 | 3,230 |
| 1997 | 3,240 | 14 | 3,254 | 132 | | 132 | 3,372 | 14 | 3,386 |
| 1998 | 3,369 | 34 | 3,403 | 502 | | 502 | 3,871 | 34 | 3,905 |
| 1999 | 3,288 | 33 | 3,321 | 775 | | 775 | 4,063 | 33 | 4,096 |
| 2000 | 4,221 | 52 | 4,330 | 811 | | 811 | 5,089 | 52 | 5070 |
| 2001 | 5,162 | 113 | 5,275 | 939 | | 939 | 6,101 | 113 | 6,214 |
| 2002 | 5,563 | 101 | 5,664 | 973 | | 973 | 6,536 | 101 | 6,638 |
| 2003 | 5,455 | 93 | 5,549 | 919 | 160 | 1,079 | 6,374 | 253 | 6,628 |
| 2004 | 5,130 | 107 | 5,237 | 1,325 | 60 | 1,385 | 6,455 | 167 | 6562 |
| 2005 | 4,862 | 96 | 4,959 | 1,722 | 0 | 1,722 | 6,584 | 96 | 6,680 |
| 2006 | 4,840 | 95 | 4,934 | 1,701 | 0 | 1,701 | 6,541 | 95 | 6,635 |
| 2007 | 4,590 | 101 | 4,691 | 1,920 | 0 | 1,920 | 6,511 | 101 | 6,612 |
| 2008 | 3,575 | 93 | 3,668 | 2,116 | 0 | 2,116 | 5,692 | 93 | 5,784 |
| 2009 | 2,644 | 54 | 2,698 | 1,949 | 0 | 1,949 | 4,593 | 54 | 4,647 |
| 2010 | 2,894 | 69 | 2,963 | 2,091 | 0 | 2,091 | 4,985 | 69 | 5,054 |
| 2011 | 2,959 | 63 | 3,022 | 2,027 | 0 | 2,027 | 4,986 | 63 | 5,049 |
| 2012 | 3,243 | 82 | 3,326 | 1,816 | 0 | 1,816 | 5,059 | 82 | 5,142 |
| 2013 | 3,294 | 77 | 3,370 | 1,866 | 0 | 1,866 | 5,160 | 77 | 5,236 |
| 2014 | 3,129 | 59 | 3,188 | 2,157 | 0 | 2,157 | 5,287 | 59 | 5,345 |
| 2015 | 2,977 | 72 | 3,048 | 2,174 | 0 | 2,174 | 5,151 | 72 | 5,222 |

Source of data: City of Vacaville

### 2.2.1 City Groundwater Pumpage 2011 - 2015

Total groundwater pumping by the City for 2011 to 2015 ranged between 5,049 to 5,345 AF (**Table 2-2**).

**Table 2-2**
**Groundwater — Volume Pumped[1]**

| Basin Name(s) | Aquifer Unit | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| Sacramento Valley Basin/Solano Subbasin | Basal Zone | 4,986 | 5,059 | 5,160 | 5,287 | 5,151 |
| Sacramento Valley Basin/Solano Subbasin | Non-Basal Zone | 63 | 82 | 77 | 59 | 72 |
| **Total groundwater pumped** | | 5,049 | 5,142 | 5,236 | 5,345 | 5,222 |

*Units: acre-feet per year*
*[1]Pumpage amount based on volumetric meter readings*

### 2.2.2 Projected City Groundwater Pumpage 2020 - 2040

Based on normal water years, projected groundwater supplies are summarized in **Table 2-3**. Total City groundwater pumpage in normal years is projected to increase to 8,100 AF in 2040 as new City wells come on line.

**Table 2-3**
**Groundwater — Volume Projected to be Pumped**
(Normal Water Year)

| Basin Name(s) | Aquifer Unit | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Sacramento Valley Basin/Solano Subbasin | Basal Zone | 6,900 | 7,200 | 7,600 | 8,000 | 8,000 |
| Sacramento Valley Basin/Solano Subbasin | Non-Basal Zone | 100 | 100 | 100 | 100 | 100 |
| **Total groundwater projected[1]** | | 7,000 | 7,300 | 7,700 | 8,100 | 8,100 |

*Units: acre-feet per year*
*Includes future planned expansion*
1. *Source Table 6-9 Retail Water Supplies – Projected (personal communication, Christina Castro, City of Vacaville, February 18, 2016)*

The City anticipates the addition of three new wells during the period from about 2020 to 2040 if the general plan is built out as predicted. With the existing demands, at least one new well is proposed in the next five years and another two wells are projected to be replaced by 2040. New wells will be geographically separated by a minimum distance of one-half mile for new and existing wells to minimize the impact to the aquifer. New development projects to the east of Leisure Town Road include new potential well sites. The City will drill test wells and conduct zone water quality sampling to determine the most desirable site for a new well. Well 7 is currently out of service and Well 8 is nearing the end of its useful life due to the cost of repairs outweighing the production value (personal communication, Christina Castro, City of Vacaville, March 18, 2016).

Projected water supply sources in future dry water years (single-dry and/or multiple-dry water years) are summarized in **Table 2-4**. Total City groundwater pumpage in dry years is projected to increase to 9,700 AF in 2040 as new City wells come on line. The City has the capability to increase the amount of groundwater extraction for a period of time should surface water not be available.

**Table 2-4**
**Groundwater — Volume Projected to be Pumped**
(Dry Water Years)

| Basin Name(s) | Aquifer Unit | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| Sacramento Valley Basin/Solano Subbasin | Basal Zone | 8,220 | 8,640 | 9,060 | 9,600 | 9,600 |
| Sacramento Valley Basin/Solano Subbasin | Non-Basal Zone | 100 | 100 | 100 | 100 | 100 |
| **Total groundwater projected** | | 8,320 | 8,740 | 9,160 | 9,700 | 9,700 |

*Units: acre-feet per year*
*Includes future planned expansion, source: (personal communication, Christina Castro, City of Vacaville, February 18, 2016)*

The City's conjunctive water management program allows it to adjust its groundwater production so that groundwater levels recover to spring 1992-1993 "base year" levels during normal years. As discussed further below, the base year water levels are used to define the "normal condition" referenced in the Master Water Agreement (SID and City, 1995). Groundwater levels may decline below base year levels during dry years with increased pumpage, but levels should remain above historical lows. Conjunctive water management is used to restore groundwater levels to base year conditions following a dry year (or multiple-dry years) when increased pumpage has occurred. Following dry years (i.e., in normal or wet years), surface water utilization is increased, while groundwater pumping is reduced in order to restore groundwater levels to base year conditions. During periods that follow a dry year, the City may target groundwater production amounts that are lower than the amounts shown in **Table 2-3** as surface water availability allows.

During the development of future City groundwater supplies and the replacement of its older wells, consideration will be given to optimizing the pumping distribution in the City's urban planning area. The optimal location of new and replacement wells will include consideration of such factors as maintaining groundwater levels above historical lows, reducing energy costs as feasible, and ensuring delivered water meets all applicable drinking water standards.

### 2.2.3 Other Pumpage in Northern Solano County

Prior to construction of the Solano Project, both municipal and agricultural users relied primarily on groundwater. Wells were perforated primarily in the Quaternary alluvium and the upper and middle zones of the Tehama Formation, and groundwater levels declined significantly in those zones. After completion of the Solano Project in 1958, most agricultural users switched to surface water, and groundwater levels recovered. Most growers in SID rely primarily on surface water, and growers in MPWD and RD 2068 use surface water exclusively (Solano Agencies, 2005).

After the City of Vacaville, SID, and the City of Dixon are the largest producers of groundwater in northern Solano County. SID operates wells to supplement surface water supplies and also to provide for drainage due to a high water table in certain areas. Although the amount of pumpage by privately owned wells in SID boundary is unknown, annual metered pumpage is available for SID-owned wells since 1964. SID's pumpage ranged from a low of 2,311 AF during a wet year (1983) to a high of 13,965 AF during the 1976 drought year. SID district pumping in 2014 was 10,184 AF.

The City of Dixon relies entirely on groundwater for its water supply. The City of Dixon is supplied with domestic water by California Water Service Company (Cal Water) and the City of Dixon Water Service. The City's water demand in 2015 was approximately 1,782 AF/year.

The RNVWD also produces groundwater from the basal zone of the Tehama Formation. RNVWD pumpage was about 40 AF in 2003 (LSCE, 2003). Pumpage by industrial and domestic wells in unincorporated portions of the Vacaville area is unmetered.

Groundwater development in the Vacaville area by others than the City and RNVWD has largely been from the upper part of the aquifer system rather than the basal zone of the Tehama Formation.

### 2.2.4 Conjunctive Water Use and Management

The City conjunctively manages its groundwater and surface water resources to most effectively use those resources during different water year types. This has been previously demonstrated to be an effective and flexible management approach. Continued conjunctive water management is expected to enable the City to meet its future water demands for a 20-year horizon and beyond. Groundwater-related objectives of the City's conjunctive water management approach are to:

1) Recognize and implement actions to prevent persistent water level declines, and
2) Continue to maintain water levels above historical lows when levels temporarily decline during dry years to minimize adverse consequences that would result from over pumping the aquifer system.

As discussed below, groundwater monitoring data collected by the City indicate the response of the aquifer system to variations in the City's annual pumping amounts. Spring groundwater levels measured during 1992-1993 were initially used to establish "base year" groundwater levels, or the levels to which the aquifer had recovered in response to an estimated sustainable level of pumpage. The 1992-1993 base year groundwater levels have been augmented with more complete data collected during 2002-2015. This base year groundwater level concept serves to guide conjunctive management of the City's water resources. The base year concept is used to define the "normal condition" referenced in the Master Water Agreement between the City of Vacaville and SID signed on May 25, 1995.

Base year water levels are not anticipated to be exceeded during normal water years in response to the pumpage associated with those years. The concept also recognizes that if pumpage is increased during single-dry or multiple-dry years, water levels would temporarily decline to below base year levels in response to increased pumpage. Following a short-term water level decline during a dry year with increased pumping, the base year groundwater levels provide a target to which to restore water levels.

In summary, the City's conjunctive water management approach is based on the following:

1. Spring 1992-1993 groundwater levels represent base year spring groundwater recovery levels.

2. The base year groundwater levels are based on a historical level of pumpage for the Elmira Road well field that appears to be sustainable.

3. During dry years with increased pumpage, groundwater levels may be lower than base year groundwater levels and the reverse would generally occur during periods of reduced pumpage. Following a dry year condition where increased pumpage has occurred, conjunctive water management will be used to restore groundwater levels to base year conditions.

4. The 1992-1993 base year groundwater levels, in conjunction with the 2002-2015 levels which include more complete data during peak extraction periods, provide an important means for measuring aquifer system response to future pumping that occurs as part of the City's conjunctive water management plan.

5. As the City's well field expands to the urban planning area, additional groundwater monitoring will be necessary to evaluate water level responses to the additional groundwater development and provide a better understanding of spring groundwater level recovery.

Base year groundwater level conditions have only been established for the Elmira area. For purposes of this Memorandum, the modeling analysis summarized below (and included in more detail in **Appendix B**) is based on the assumption that areas north of the Elmira Road well field would respond similarly to pumping. The data from the Elmira Road well field are used to establish the drawdown occurring in response to normal water year pumpage for that area. However, the drawdown occurring at the Elmira location would not be applicable to areas outside the Elmira Road well field.

## 2.3 GROUNDWATER CONDITIONS

### 2.3.1 Hydrogeology

Most City and non-City wells in the Vacaville area are completed in the Tehama Formation, which has been subdivided into upper, middle, and basal zones. The City's wells are largely completed in the basal zone of the Tehama Formation. City Well 1 is also partially completed in older pre-Tehama deposits. A geologic map is provided as **Figure 2-5** to illustrate the regional geology. A detailed discussion of the regional geologic setting, including geologic cross sections, is provided in *Hydrostratigraphic Interpretation and Groundwater Conditions of the Northern Solano County Deep Aquifer System* (LSCE, 2010). A brief summary of geologic conditions is provided below.

The four water bearing formations discussed in this document include the recent Quaternary alluvial deposits, and the underlying Pliocene and Pleistocene upper, middle, and basal zones of the Tehama Formation. Due to the proximity and limited amount of information for both the recent Quaternary alluvial deposits and the upper zone of the Tehama Formation, these units will generally be discussed together for the purposes of this report. As mentioned above the Tehama Formation is the primary aquifer for agricultural and municipal water supply in northern Solano County, including the Vacaville area. This formation consists of slightly to moderately consolidated fluvial, alluvial, and lacustrine deposits and includes interlayered clay, silt, sand, and gravel beds. A stiff blue lacustrine clay found near the upper boundary of the formation and other relatively continuous clay layers divide the formation into upper, middle, and basal zones.

In the Vacaville area, the continuous clay layers within the Tehama Formation appear to thin to the west-southwest, with some layers pinching out altogether. The Tehama Formation has a thickness of up to 2,200 feet in the vicinity of the City's eastern boundary and an outcrop area of over 35 square miles in the English Hills, north of the City, and continuing north toward the Solano County line (**Figure 2-5**). This outcrop serves as the primary recharge area for the Tehama Formation.

The Quaternary alluvium and upper and middle zones of the Tehama Formation are used for domestic and agricultural water supply. Southwest of the Highway 80/Midway Road junction, the upper and middle Tehama Formation zones are characterized by predominately thick, fine-grained silt and clay with a few thin sand and gravel beds. Northeast of this area, the number of coarser-grained beds appears to increase. In most western areas, the fine-grained nature, discontinuity of the sands, and generally low yields make these zones unsuitable for high capacity municipal water wells. Typically, these zones are only capable of producing 100 to 300 gallons per minute (gpm) with specific capacities of less than 2 gallons per minute per foot (gpm/ft), although some wells can produce up to 1,000 gpm. Aquifer test data in the upper zone are limited, but a transmissivity of only 1,500 gallons per day per foot (gpd/ft) was estimated based on a test of the City's DeMello well. Reliable transmissivity estimates are not available for the middle zone.

The basal zone of the Tehama Formation includes gravel and cobble deposits and layers of volcanic tuff and conglomerate cemented with calcium carbonate. The more permeable portions of the basal zone are comprised primarily of gravelly sand with calcium carbonate cementation in some areas. The basal zone occurs near the surface on the western edge of the City's Elmira Road well field and gradually deepens to the east (**Figure 2-6**, basal zone outlined in blue). The basal zone ranges in thickness from less than 400 feet in the Elmira Road area, to greater than 700 feet between Vacaville and Dixon (**Figure 2-7**). Up to 350 feet of this zone yields significant quantities of groundwater. The bottom of the basal zone occurs at a depth of about 2,400 feet in the vicinity of the City's Easterly Wastewater Treatment Plant and near the Midway Road/Highway 80 junction area. East of these areas, the basal zone appears to contain fine-grained sand beds. Detailed correlations using numerous oil and gas test holes with geophysical logs indicate that the basal zone extends beneath the Dixon area at a depth of 2,000-2,500 feet. The top of the basal zone was encountered at 1,980 feet below ground surface (bgs) during construction of a multiple completion monitoring well in the Dixon area for Solano County Water Agency (SCWA) (LSCE, 2010). Regional correlations suggest a finer-grained sandy zone extending eastward to beneath the Davis area at depths below existing municipal wells. However, the yield and water quality of this zone are presently unknown.

# 3 AQUIFER CHARACTERISTICS

Specific capacities of wells completed in the basal zone in the Vacaville area generally range from 4 to 24 gpm/ft, depending on the thickness of aquifer materials encountered by the well and included in the perforated interval. The City's municipal basal zone wells range in capacity from 500 to 1,800 gpm.

**Table 3-1** summarizes aquifer characteristics estimated for the basal zone in the northeastern area based on pumping tests conducted in these wells. Constant-rate pumping tests have been conducted in the City's three northern water supply wells (Well 14, 15, and 16) and vary in duration from 4 hours to 19 days. Data from these tests have been used to determine the specific capacity of the wells and estimate aquifer characteristics, including transmissivities and aquifer storativities. Although more than one test has been conducted at some of these wells, only the results from the most recent test at each well are shown on **Table 3-1**.

As shown on **Table 3-1,** the mean transmissivities calculated for the three City of Vacaville wells completed in the basal zone of the Tehama Formation (Wells 14, 15, and 16), range from 39,700 to 56,600 gpd/ft, with an overall mean of 48,100 gpd/ft. The transmissivity is significantly lower to the north in the RNVWD wells (mean of about 17,000 gpd/ft). Storativities in the northern Solano County area range from $1.6 \times 10^{-4}$ to $3.2 \times 10^{-4}$, with an overall mean of $2.2 \times 10^{-4}$.

## Table 3-1
## Aquifer Characteristics, Northeastern Area, City of Vacaville

| Pumped Well | Observation Well | Distance (ft) | Start Date | Test Length (hrs) | Discharge Rate (gpm) | Depth to Water (Start) (ft) | Depth to Water (End) (ft) | Drawdown (ft) | 24-hr Specific Capacity (gpd/ft) | Pumping Phase Transmissivity (gpd/ft) | Pumping Phase Storativity - | Pumping Phase Method of Analysis | Recovery Phase Transmissivity (gpd/ft) | Recovery Phase Method of Analysis | Mean Values Transmissivity (gpd/ft) | Mean Values Storativity - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Well 14[a] | - | - | 04/15/03 | 24 | 1,740 | 153.82 | 246.03 | 92.21 | 18.8 | 54,900 | - | Cooper-Jacob | 52,700 | Theis | 56,600 | 1.6E-04 |
| | MW-14 | 183 | | | | 151.96 | 175.30 | 23.35 | - | 61,800 | 1.6E-04 | Cooper-Jacob | 57,000 | Theis | | |
| | MW-15-1815' | 4,530 | | | | 141.09 | 140.26 | -0.83 | - | - | - | - | - | - | | |
| | Well 15 | 4,580 | | | | 138.57 | 138.95 | 0.38 | - | - | - | - | - | - | | |
| | MW-16-1400' | 6,970 | | | | 160.73 | 161.16 | 0.43 | - | - | - | - | - | - | | |
| | MW-98B | 9,290 | | | | 124.87 | 125.16 | 0.28 | - | - | - | - | - | - | | |
| Well 15[a] | - | - | 04/14/03 | 10 | 1,790 | 135.32 | 216.15 | 80.83 | 20.8 | 48,900 | - | Cooper-Jacob | 40,000 | Theis | 39,700 | 3.2E-04 |
| | MW-15-188' | 112 | | | | 16.78 | 16.53 | -0.25 | - | - | - | - | - | - | | |
| | MW-15-508' | 112 | | | | 29.51 | 29.12 | -0.39 | - | - | - | - | - | - | | |
| | MW-15-1815' | 112 | | | | 136.11 | 181.66 | 45.55 | - | 37,000 | 3.2E-04 | Theis | 33,000 | Theis | | |
| | MW-16-1400' | 4,490 | | | | 159.30 | 161.36 | 2.06 | - | - | - | - | - | - | | |
| | Well 14 | 4,580 | | | | 153.15 | 154.02 | 0.86 | - | - | - | - | - | - | | |
| | MW-14 | 4,740 | | | | 151.63 | 152.20 | 0.56 | - | - | - | - | - | - | | |
| | MW-98B | 4,810 | | | | 123.77 | 125.46 | 1.69 | - | - | - | - | - | - | | |
| Well 16[b] | - | - | Spring 07 | 19 days | 2,230 | 178.65 | 359.15 | 180.50 | 15.7 | - | - | - | - | - | - | - |
| | MW-16-(1430') | 144 | | | | 178.41 | 264.08 | 85.67 | - | 48,000 | 1.7E-04 | Theis | 48,000 | Theis | 48,000 | 1.7E-04 |
| Mean (City of Vacaville basal zone wells 14, 15 and 16) | | | | | | | | | | | | | | | **48,100** | **2.2E-04** |

a. Source: LSCE. 2006. *Evaluation of Hydrogeologic Conditions and Groundwater Supplies for SB 221/610 Requirements*, *Administrative Draft,* prepared for City of Vacaville.

b. Source: LSCE. 2008. *Technical Memorandum, Well 16 Aquifer Test, Spring 2007, City of Vacaville, Solano County, CA*, Prepared for City of Vacaville.

#### 3.1.1 Groundwater Levels

Groundwater level data for the City's wells are available from the City's monitoring program. The monitoring program includes semi-annual manual water level measurements in 13 production wells and 11 monitoring wells. In addition to the manual measurements, nine production wells are also monitored electronically with transducers connected to the City's Supervisory Control and Data Acquisition (SCADA) system. Groundwater levels in other wells in and near the City are also monitored at least semi-annually by (or on behalf of) other entities, including SCWA, DWR, the U.S. Bureau of Reclamation (USBR), SID, and RNVWD (**Figure A-1**).

Appendix A provides well location maps (Figures A-1 and A-2), representative water level hydrographs for the Vacaville area, and water level contour maps (Figures A-3 to A-11). A complete set of hydrographs for all wells in the vicinity are provided in **Appendix C** for the wells shown on Figure A-1. The hydrographs included in **Appendix A** are organized according to the four primary formations in which the wells are completed: Quaternary alluvium and the upper, middle, and basal zones of the Tehama Formation (**Figure A-2**). Groundwater elevation contour maps prepared for the Quaternary alluvium and upper zone of the Tehama Formation and the basal zone of the Tehama Formation are also included in **Appendix A** (**Figures A-6** and **A-7** and **Figures A-9** and **A-10**) to indicate the hydraulic gradient and direction of groundwater flow beneath the City in the spring and fall of 2015.

Water levels in wells completed in Quaternary alluvium and the upper zone of the Tehama Formation (**Figures A-3, A-4 and A-5**) show similar trends. Water levels in those zones generally show declining levels from the 1940s to the early 1960s as a result of increasing groundwater pumpage. Beginning in the 1960s, water levels rose following the delivery of surface water from the Solano Project and corresponding reductions in groundwater pumpage. Water levels have remained relatively high since the late 1960s, largely unaffected by wet or dry climatic periods, with depths to water typically less than 10 feet. Several wells on the eastern side of the City show some declines in the early 2010s, associated with the recent drought, followed by recent recoveries in 2015. Groundwater levels in the Quaternary alluvium and upper zone of the Tehama Formation show small seasonal effects with slightly higher groundwater levels in the spring. Water levels in these relatively shallow aquifers appear to be unaffected by basal zone pumpage. Maps showing contours of equal groundwater elevation in the Quaternary alluvium and the upper zone of the Tehama Formation for the spring and fall of 2015 (**Figures A-6** and **A-7**) indicate generally eastward to northeastward flow directions.

Water level data are more limited for wells completed in the middle zone of the Tehama Formation. **Figure A-3** illustrates groundwater levels for two wells (6N/1W-23C1 and 7N/1W-34F1) monitored by DWR in the Vacaville area that had sufficient historical data to indicate water level trends in this zone. Groundwater level trends in these wells are generally similar to those observed in the upper zone of the Tehama Formation. Also shown in **Figure A-3** are two monitoring wells RNVWD MW-446 screened between 426 and 436 feet and RNVWD MW-594 screened between depths of 564 to 584 feet) located near RNVWD production Well No. 1. Groundwater levels in the RNVWD monitoring wells show declining groundwater levels until present. The trends in these wells are likely due to local pumping effects from the RNVWD water supply well and a higher level of hydraulic connectivity between the middle and deeper (basal) Tehama Formation deposits.

Water level data since 2000 for the basal zone of the Tehama formation are shown in **Figure A-8**. A response to reduced pumping since 2008 can be seen in most of the wells shown. A detailed hydrograph of City Well 8 at Elmira Road shows a typical water level response to pumpage for the City's basal zone wells since 1988 (**Figure 2-8**). In order to obtain generally static measurements, manual water level measurements in the City's wells since 1992 have been preceded by a three-day shutdown period that eliminated the most pronounced effects of recent pumping by one or more nearby wells to ensure consistent and generally static monitoring conditions. Beginning in 2002, selected transducer measurements from the City's SCADA system have been available to indicate the highest water levels in the spring and the lowest water levels during the summer.

As noted above, the City has considered 1992 to 1993 to represent a "base year" groundwater level condition. The maximum spring water levels in 2003 were approximately the same as 1992 for a similar level of Elmira Road pumpage (about 5,400 AF per year), and the spring 1993 and 2003 water levels are highlighted on **Figure 2-8**. Water level data from Well 8 reflect changes in the City's basal zone pumpage from the Elmira Road well field; specifically, water levels increase as pumpage decreases and vice versa.

The City has reduced its Elmira Road basal zone pumpage by shifting more pumpage to new wells constructed in the northeast sector (Wells 14, 15, and 16). As of 2015, 42% of groundwater production occurred in the northeast sector wells, up from 30% in 2007 and 16% in 2000. Overall, this has resulted in water level declines in the northeast sector wells and reduced drawdown in the Elmira Road well field. A hydrograph of Well 14, which has the longest period of record of the northeast sector production wells, is included in **Appendix A** (**Figure A-8**). Water levels in Well 14 declined at a faster rate between 1998 and 2005 than in the Elmira Road wells (about 50 feet in seven years), stabilized between 2005 and 2007, and have risen since 2007 to 2013. Recent declines seen between 2013 and 2015 are likely due to the recent drought and increased dependence on groundwater pumping.

Groundwater elevations in the basal zone of the Tehama Formation are much lower than in the middle and upper zones in the Vacaville area, ranging from about 20 feet above sea level in RNVWD to 70 to 80 feet below sea level (spring and fall 2015, respectively) in the vicinity of the City's main well field on Elmira Road (**Figures A-9 and A-10**). A pumping depression in the basal zone exists in the Elmira Road area (**Figures A-9** and **A-10**), and the gradient for groundwater flow is southerly toward this depression. North of the City, the gradient has a magnitude of approximately 47 feet per mile which is much steeper than the gradient in the Quaternary alluvium (**Figures A-6** and **A-7**). The gradient in the basal zone becomes less steep in the Elmira Road area, e.g., the gradient between Well 14 and the Elmira Road wells is only about 6 feet per mile. This is due to the northerly expansion of the cone of depression in the Elmira Road area as more pumpage has been shifted to Wells 14 and 15 in the northeast sector.

In general, water levels in wells completed in the basal zone of the Tehama Formation (**Figures A-3 and A-8)** show similar trends with a few exceptions. Water levels were relatively stable from the mid-1960s to the mid-1970s followed by a decline from the mid-1970s to the early 1980s when levels stabilized until the early 1990s. From the early 1990s water levels rose until about 2000 when levels declined in most wells until 2009 when levels stabilized through 2013 and then slightly declined until present. One exception to this trend is RNVWD1 with water levels that rose over 60 feet from 2010 to present.

### 3.1.2 Groundwater Quality

Every three years, the City performs water quality monitoring as required for all public water supply systems. The City also collects samples annually for nitrate analysis. Water quality is generally good at all City wells. Most of the historical data do not show signs of water quality degradation, and concentrations have remained stable. **Figure 2-9** shows a map of the locations of all wells with water quality data.

Although the City's monitoring wells are not used for public supply, they are good indicators of the types of water found in the aquifers below the City and therefore tapped by the City's supply wells (**Table 3-2**). Almost all of the monitoring well samples meet primary and secondary drinking water Maximum Contaminant Levels (MCLs) for general minerals[2]. One exception occurred in the recent sample from 2011 at DeMello MW-95ft, where the TDS level is at the secondary MCL value of 500 mg/L. Most of the concentrations of drinking water metals[3] were found to be below detection limits for historic and recent samples. Levels of chromium (total), iron, manganese, and thallium equaled or exceeded the primary and secondary MCLs in a few wells. Total chromium values for two samples in MW-16-1430 (11/19/02 and 7/5/07) were at the primary MCL of 50 µg/L, but the 2011 sample (1/18/11) was below, at 37 µg/L. MW-98A, MW-98B, and MW-98C all had concentrations above the secondary MCL of 300 µg/L for iron, as high as 1,290 µg/L (in MW- 98A on 11/23/99). The 2011 sample in MW-98C, however, was below the MCL at 210 µg/L. The 2011 sample in MW-98B, exceeded the secondary MCL for manganese of 50 µg/L with a concentration of 59 µg/L. This sample is similar but slightly higher than the previous concentration of 45.6 µg/L measured more than ten years before it in 1999. One historical sample in MW-15-508ft exceeded the primary MCL for thallium of 2 µg/L, at a concentration of 3.54 µg/L in 2000, but 2011was found to be at concentrations below the detection limit (<1 µg/L).

Arsenic, boron, chromium, iron, and manganese concentrations showed some spatial and aquifer zone relationships, and ranges of these analytes are included in **Figure 2-10**. Generally, the monitoring well water quality results indicate that arsenic, boron, chromium, iron, and manganese concentrations are higher at depths below 500 ft, in the basal zone compared to the shallower Quaternary alluvium and upper zone. Arsenic concentrations are found to be highest in wells completed in the basal zone, as high as 7.4 µg/L (the primary MCL is 10 µg/L). Boron concentrations more than double in concentration in the basal zone compared to the shallower wells, reaching values as high as 460 µg/L (in the 2011sample taken from MW-98C). Chromium concentrations are lower in the east compared to wells in the west, and generally higher in wells completed in the basal zone compared to shallower units. Iron concentrations are significantly higher in the basal zone wells to the north and east, with most wells having concentrations below the detection limit, except for the three MW-98-series wells. The highest value (and only detectible value) of iron in shallower wells is 150 µg/L, while as mentioned above, the maximum level measured in basal zone wells is 1,290 µg/L. Manganese has a similar spatial and aquifer zone relationship as iron, where the MW-98-series of basal zone wells have much higher concentrations of manganese compared to shallower and southwestern wells. The MW-98 wells have manganese concentrations ranging from 20 to 59 µg/L, whereas most shallow and southwestern wells have non-detectible concentrations to a maximum of 13.3 µg/L.

A summary of all available water quality data for selected constituents (total dissolved solids (TDS), nitrate, arsenic, and hexavalent chromium) is provided in **Appendix D** for wells in Solano County, including City wells. Total dissolved solids (TDS) concentrations in basal zone wells in Solano County range from 250 to 480 milligrams per liter (mg/L) between 1986 and 2014. The TDS concentration in

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[2] General minerals include specific conductance, total dissolved solids, pH, Na, K, Mg, Ca, Cl, SO4, NO3, F, alkalinity series (total, CO3, HCO3, OH), and hardness.

[3] Drinking water metals include Ag, Al, As (total and dissolved), B, Ba, Be, Cd, Cr (total and dissolved), Hexavalent Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, Se, Tl, V, and Zn.

## Table 3-2
## City of Vacaville Monitoring Well Groundwater Quality Results

| | | | DeMello MW-95ft | | MW-15-188ft | | | MW-15-508ft | | MW-16-117ft | | | MW-16-1166ft | | | MW-16-1430ft | | | MW-98A | | | MW-98B | | MW-98C | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Completion Information[e]: | | | QA - 65-85 | | QA_UT - 158-178 | | | UT - 438-498 | | UT - 97-107 | | | BT - 1136-1162 | | | BT - 1264-1374 | | | BT - 1727-1745, 1790-1830 | | | BT - 1559-1579, 1700-1710, 1720-1730, 1778-1798 | | BT - 2152-2192, 2234-2264, 2285-2305 | |
| | Units | MCL [a] | 7/16/01 | 1/5/11 | 8/18/00 | 5/22/01 | 1/5/11 | 8/18/00 | 1/4/11 | 5/29/02 | 5/30/07 | 1/4/11 | 5/29/02 | 5/30/07 | 12/16/10 | 11/19/02 | 7/5/07 | 1/18/11 | 11/16/98 | 11/23/99 | 1/10/11 | 1/13/99 | 8/9/11 | 1/29/99 | 1/12/11 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Temp | deg C | | | 19.2 | | | 20.3 | | 21 | | | 19.5 | | | 20.4 | | | 22.4 | | | 21.1 | | 21.9 | | 20.4 |
| pH | pH Units | 6.5-8.5 [b] | | 7.46 | | | 7.59 | | 7.42 | | | 7.68 | | | 7.43 | | | 7.39 | | | 7.89 | | 8.2 | | **8.54** |
| SC | umhos/cm | 900/1,600 [b] | | 799 | | | 350 | | 530 | | | 430 | | | 480 | | | 490 | | | 490 | | 500 | | 530 |
| Turbidity | NTU | 5 [b] | | 0.61 | | | 2.04 | | 0.19 | | | 0.24 | | | 0.23 | | | 0.14 | | | 1.71 | | 1.3 | | 0.34 |
| DO | mg/L | | | 3.01 | | | 4.13 | | 1.19 | | | 4.69 | | | 3.21 | | | 1.32 | | | 0.72 | | 1.89 | | 0.09 |
| ORP | mV | | | 51 | | | 67 | | 26 | | | 92 | | | 25 | | | 47 | | | -6 | | -178 | | -180 |
| **General Minerals** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC | umhos/cm | 900/1,600 [b] | 560 | 790 | 425 | 380 | 350 | 543 | 530 | 390 | 430 | 430 | 450 | 458 | 480 | 460 | 470 | 490 | 500 | 477 | 490 | 494 | 500 | 506 | 530 |
| TDS | mg/L | 500/1,000 [b] | 380 | **500** | 225 | 250 | 200 | 291 | 320 | 250 | 272 | 260 | 310 | 330 | 280 | 280 | 302 | 300 | 271 | 296 | 280 | 362 | 350 | 302 | 320 |
| pH | pH Units | 6.5-8.5 [b] | 7.6 | 7.7 | 7.78 | 7.5 | 7.8 | 7.84 | 7.6 | 7.6 | 7.67 | 7.5 | 7.7 | 7.9 | 7.9 | 7.8 | | 8 | 7.67 | 7.93 | 8 | 8.02 | 8.25 | 8.32 | 8.4 |
| Na | mg/L | | 34 | 40 | 34.8 | 36 | 29 | 55.2 | 57 | 39 | 41 | 41 | 49 | 42 | 42 | 63 | 53.4 | 62 | 40.3 | 38.8 | 42 | 84 | 87 | 93.9 | 100 |
| K | mg/L | | <1 | <1 | 1.39 | 1.2 | 1.2 | 1.72 | 1.3 | <1 | <1 | 1 | 5.7 | 5.3 | 5.9 | 2.7 | 2.5 | 2.6 | 3.15 | 3.18 | 3.5 | 5.22 | 5.1 | 1.86 | 1.6 |
| Mg | mg/L | | 26 | 34 | 15 | 18 | 15 | 10.1 | 12 | 13 | 13 | 14 | 17 | 18 | 20 | 19 | 21 | 18 | 27.3 | 27.3 | 31 | 6.01 | 6.3 | 8.4 | 8 |
| Ca | mg/L | | 54 | 72 | 28.4 | 31 | 27 | 38.6 | 45 | 40 | 36 | 37 | 35 | 30 | 31 | 18 | 19 | 21 | 21 | 21.6 | 23 | 13.6 | 16 | 11.1 | 10 |
| Cl | mg/L | 250/500 [b] | 62 | 91 | 11.1 | 11 | 7.9 | 7.83 | 7.1 | 12 | 11.1 | 10 | 7.1 | 6.7 | 6.3 | 6.5 | 6.73 | 7.7 | 8.24 | 7.72 | 7.1 | 7.88 | 9.2 | 7.41 | 6 |
| SO4 | mg/L | 250/500 [b] | 19 | 26 | 6.17 | 4.9 | 5.7 | 24 | 23 | 6.3 | 7.6 | 7.5 | 17 | 17 | 17 | 19 | 15.94 | 26 | 16.8 | 16.4 | 15 | 25.6 | 26 | 43 | 40 |
| NO3 (as NO3) | mg/L | 45 | 14 | 27 | 4.32 | 4.1 | 3.2 | 4.86 | 4.8 | 4.2 | 1.1 | 4.5 | 4.1 | 1.1 | 4.6 | 2.1 | 0.63 | 2.5 | 2.24 | | 2.3 | <0.1 | <0.44 | 0.32 | <0.88 |
| F | mg/L | 2 | <0.1 | 0.13 | 0.346 | 0.23 | 0.29 | 0.211 | 0.11 | 0.31 | 0.4 | 0.21 | 0.23 | 0.3 | 0.14 | 0.52 | 0.3 | 0.17 | <1 | | 0.14 | 0.151 | 0.14 | 0.11 | 0.13 |
| **Alkalinity Series** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Alkalinity | mg/L | | | 220 | | 40 | 170 | | 240 | 190 | 205 | 200 | 200 | 222 | 220 | 230 | 234 | 220 | | | 240 | | 230 | | 220 |
| CO3 | mg/L | | 150 | <2 | <1 | <1 | <2 | <1 | <2 | <1 | | <2 | <1 | | <2 | <1 | | <2 | <10 | <1 | <2 | <1 | 2.9 | <10 | 4.1 |
| HCO3 | mg/L | | 150 | 270 | 20.8 | 40 | 200 | 264 | 300 | 190 | 296 | 250 | 200 | 320 | 260 | 230 | 337 | 270 | 242 | 253 | 300 | 259 | 280 | 238 | 270 |
| OH | mg/L | | <1 | <2 | <1 | <1 | <2 | <1 | <2 | <1 | | <2 | <1 | | <2 | <1 | | <2 | <10 | <1 | <2 | <1 | <2 | <10 | <2 |
| Hardness | mg/L | | 240 | 320 | 133 | 150 | 130 | 138 | 160 | 150 | 140 | 150 | 160 | 146 | 160 | 120 | 131 | 120 | 165 | 166 | 190 | 58.6 | 65 | 62.3 | 58 |
| **Drinking Water Metals** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ag | µg/L | 100 [b] | <10 | <0.5 | <5 | | <0.5 | <5 | <0.5 | <10 | <0.5 | <0.5 | <10 | <0.5 | <0.5 | <10 | <0.5 | <0.5 | <5 | | <0.5 | <5 | <0.5 | <5 | <0.5 |
| Al | µg/L | 1,000 | <50 | <20 | <50 | | 96 | <50 | <20 | <50 | 29 | <20 | <50 | <20 | <20 | <50 | <20 | <20 | <50 | | <20 | <50 | <20 | <50 | <20 |
| As - Total | µg/L | 10 | 2 | 3 | <5 | <2 | 1.3 | <5 | <1 | <2 | 1.5 | 1.2 | <2 | 5 | 4.5 | 7.4 | 2.3 | 1.9 | <3 | | 2.9 | 4.7 | 6.3 | <2 | 3.5 |
| As - Dissolved | µg/L | 10 | | 2.6 | | | 1.9 | | <1 | | | 1.1 | | | 4.7 | | | 1.8 | | | 2.6 | | 6.7 | | 3.2 |
| B | µg/L | 1,000 [c] | <50 | <50 | <50 | <50 | 63 | 68.4 | 80 | <100 | <50 | 58 | 140 | 130 | 150 | 180 | | 170 | 111 | | 110 | 280 | 290 | 420 | 460 |
| Ba | µg/L | 1,000 | 100 | 140 | 99 | | 99 | 105 | 110 | <100 | 100 | 100 | 120 | 130 | 130 | 210 | 200 | 220 | 214 | | 220 | 67.2 | 90 | 107 | 120 |
| Be | µg/L | 4 | <1 | <1 | <4 | | <1 | <4 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <0.5 | | <1 | <0.5 | <1 | <0.5 | <1 |
| Cd | µg/L | 5 | <1 | <0.5 | <10 | | <0.5 | <10 | <0.5 | <1 | <0.5 | <0.5 | <1 | <0.5 | <0.5 | <5 | <0.5 | <0.5 | <0.5 | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Cr - Total | µg/L | 50 | <10 | 5.7 | 11.5 | | 7.5 | <5 | 2.2 | <10 | 6.2 | 6.7 | <10 | 15 | 14 | **50** | **50** | 37 | 24.2 | | 19 | <5 | <1 | <5 | <1 |
| Cr - Dissolved | µg/L | 50 | | 6.7 | | | 6.6 | | 2.2 | | | 6.5 | | | 13 | | | 35 | | | 4.3 | | <1 | | <1 |
| Hexavalent Cr | µg/L | 50 [d] | | 5.3 | | | 6.5 | | 2.2 | 5.9 | | 6.7 | 15 | | 16 | | | 39 | | | 4.1 | | <0.02 | | <0.05 |
| Cu | µg/L | 1,000 [b] | <50 | <2 | <5 | | <2 | <5 | <2 | <50 | 3.4 | <2 | <50 | 5 | <2 | <50 | <2 | <2 | <5 | <5 | <2 | <5 | <2 | <5 | <2 |
| Fe | µg/L | 300 [b] | <100 | <20 | <10 | <100 | 150 | <10 | <20 | <100 | <20 | <20 | <100 | <20 | <20 | <100 | | <20 | **1000** | **1290** | **480** | **1010** | **460** | **788** | 210 |
| Hg | µg/L | 2 | <1 | <0.2 | <0.2 | | <0.2 | <0.2 | <0.2 | <1 | <0.2 | <0.2 | <1 | <0.2 | <0.2 | <1 | <0.2 | <0.2 | <0.2 | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Mn | µg/L | 50 [b] | <10 | <2 | 9 | <10 | 2.8 | 13.3 | <2 | <10 | <2 | <2 | <10 | <2 | 5 | <10 | | <2 | 35.1 | 34 | 20 | 45.6 | **59** | 34 | 21 |
| Ni | µg/L | 100 | 26 | <5 | <20 | | <5 | <20 | <5 | <10 | <5 | <5 | <10 | <5 | <5 | <10 | <5 | <5 | <20 | | <5 | <20 | <5 | <20 | <5 |
| Pb | µg/L | 15 | <5 | <0.5 | <3 | | <0.5 | <3 | <0.5 | <5 | <0.5 | <0.5 | <5 | <0.5 | <0.5 | <25 | <0.5 | <0.5 | <0.5 | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Sb | µg/L | 6 | <6 | <1 | <5 | | <1 | <5 | <1 | <6 | <1 | <1 | <6 | <1 | <1 | <30 | <1 | <1 | <1 | | <1 | <1 | <1 | <1 | <1 |
| Se | µg/L | 50 | <5 | <5 | <5 | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <25 | <5 | <5 | <4 | | <5 | <4 | <5 | <4 | <5 |
| Tl | µg/L | 2 | <1 | <1 | <2 | | <1 | **3.54** | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <5 | <1 | <1 | <0.5 | | <1 | <0.5 | <1 | <0.5 | <1 |
| V | µg/L | 50 [c] | | 8.1 | | | 9.2 | | <3 | <3 | <3 | <3 | 16 | 22 | 22 | 19 | 14 | 13 | | | 7.5 | | <3 | | 3.9 |
| Zn | µg/L | 5,000 [b] | <50 | <20 | <5 | | <20 | 5.95 | <20 | <50 | <20 | <20 | <50 | <20 | <20 | <50 | <20 | <20 | <5 | <5 | <20 | 34.5 | <20 | <5 | <20 |

a - Maximum Contaminant Levels (MCLs) listed are primary unless otherwise noted.

b - Secondary MCL

c - Drinking Water Notification (Action) Level

d - Hexavalent Chromium is regulated under the Total Chromium MCL of 50 µg/L

e - Screened Intervals are listed (in feet below ground surface) and Aquifer Units are based on the zone of completion for each monitoring well, defined as follows: QA-Quaternary Alluvium; UT-Upper Tehama; and BT-Basal Tehama

Well 1, which is completed in the Markley formation, was 546 mg/L in 2008, which slightly exceeds the recommended secondary Maximum Contaminant Level (MCL) of 500 mg/L but not the upper secondary limit of 1,000 mg/L. **Figures 2-11** and **2-12** show the location of the maximum and average TDS concentrations (respectively) in the vicinity of Vacaville. Nitrate concentrations exhibit more variability from well to well than TDS, but concentrations have been stable at most wells. Nitrate (as N) in basal zone wells ranged from non-detect (<2 mg/L) to 5.2 mg/L as N (measured in Well 2 in 1996) between 1986 and 2015. Nitrate concentrations in Wells 1, 2, 5, and 13 have historically been over 2 mg/L as N, but not near the MCL of 10 mg/L as N. **Figures 2-13** and **2-14** show the location of the maximum and average nitrate concentrations (respectively) in the vicinity of Vacaville.

Concentrations of arsenic in basal zone wells in Solano County range from <2 ug/L to 25 ug/L between 1993 and 2015. The highest average arsenic concentrations in the basal zone are found in Rural North Vacaville wells (RNVWD Well 02 and RNVWD MW-862ft), and are above the MCL of 10 ug/L with average concentrations of 15.8 and 13 ug/L. **Figures 2-15** and **2-16** show the location of the maximum and average arsenic concentrations (respectively) in the vicinity of Vacaville. Concentrations of hexavalent chromium in basal zone wells in Solano County range from <1 ug/L to 24 ug/L between 2001 and 2015. Several basal zone wells have average hexavalent chromium concentrations (September 2013 to March 2016) above the MCL of 10 ug/L (City Wells 3, 9, 14, 15, and 16). Many other wells of unknown completion also have average hexavalent chromium concentrations above the MCL of 10 ug/L, mostly located in the vicinity of Dixon. **Figures 2-17** and **2-18** show the location of the maximum and average hexavalent chromium (chromium VI) concentrations (respectively) in the vicinity of Vacaville.

There have been localized instances of impacts to shallow groundwater quality due to hazardous chemical contamination, but existing or potential municipal supplies have not been affected. Analyses for volatile organic compounds (VOCs) and other manmade constituents in the City's water supply wells have all been non-detect.

### 3.1.3 Subsidence

Land subsidence is a documented problem in parts of California and the Central Valley. In particular, land subsidence due to groundwater pumping is of major concern, especially during periods of drought or dry years when the aquifers are being stressed more than usual. Land subsidence activity can be measured and monitored, usually with continuous global positioning systems (Continuous GPS, or CGPS), extensometers (which pinpoint vertical movement of particular depths of the subsurface), and InSAR data (Interferometric Synthetic Aperture Radar, which compares the height of the land surface from satellite imagery taken at different times). The following discussion includes data from SCWA subsidence stations in Dixon and Vacaville, data from other nearby CGPS stations, and data from an extensometer outside of Solano County.

#### *3.1.3.1 SCWA Subsidence Stations*

As of June 2012, land surface elevations are being monitored at two continuous global positioning system stations (CGPS). These stations are located at the SCWA groundwater monitoring site in Dixon (DIXN) and City of Vacaville MW-16 (VCVL) (**Figure 2-19**). Data from the DIXN site show an annual trend, marked by a generally sinusoidal pattern (**Figure 2-20**). The land elevation remains relatively stable over the period of record. The data from the VCVL site show similar trends (**Figure 2-21**), with mostly stable conditions during its record between June 2012 and February 2016. A linear trend line fit to the two stations' land surface elevation values yields an approximation of the rate of ground surface change over the period of record. Over the last 3.707 years of available record at these two sites, DIXN experienced an average yearly rate of [downward] land subsidence of 0.00735 feet/year (or 2.240 mm/year or 0.088 inches/year) and VCVL experienced an average yearly rate of subsidence of 0.00564 feet/year (or 1.719 mm/year or 0.068 inches/year). Over the almost four years of available record, this translates to a total of 0.027 feet (0.33 inches) of land subsidence at DIXN and a total of 0.021 feet (0.25 inches) of land subsidence at VCVL.

#### *3.1.3.2 Nearby CGPS Stations*

In order to put the two SCWA CGPS stations' records into context, data from other nearby CGPS stations were collected and presented in **Figure 2-22**. These stations show that the land surface elevation fluctuates seasonally in this area, typically less than 0.05 feet. The nearby CGPS stations also yield insight into land subsidence rates typical of this area. Fitting a linear trend line to each nearby CGPS station land surface elevation values, the rate of ground surface change can be approximated. The table below summarizes the rate of land surface elevation change over the period of available record, where a negative land surface elevation change indicates net land subsidence (Table 3-3). For example, the site P265, which is located about 9 miles north of the VCVL site, showed on average a decrease of approximately 0.109 feet (1.3 inches) of its land surface over the last almost 10.5 years (from fall 2005 to present), resulting in an estimated rate of land surface elevation change of -0.01034 ft/year[4].

**Table 3-3**
**Rates of Land Surface Elevation Change for Nearby CGPS Stations**

| Station ID | Years of Record | Rate of Land Surface Elevation Change (ft/yr) | Rate of Land Surface Elevation Change (mm/yr) |
|---|---|---|---|
| **P261** | 11.729 | -0.00195 | -0.594 |
| **P265** | 10.496 | -0.01034 | -3.152 |
| **P266** | 10.770 | -0.00255 | -0.777 |
| **P267** | 10.882 | -0.00837 | -2.553 |
| **P268** | 10.874 | -0.00829 | -2.527 |
| **P271** | 11.718 | -0.03238 | -9.869 |

#### *3.1.3.3 Extensometer Data*

Land subsidence rates in Solano County and vicinity range from 0.00195 to 0.03238 ft/year (0.594 to 9.869 mm/year) over about the last 10 to 11 years. Another way to measure land subsidence is with a tool called an extensometer. Extensometers provide site- and depth-specific measurements of land deformation using a borehole equipped with instrumentation that is deep enough to span stratigraphic units susceptible to land subsidence. The distance between the bottom of the borehole to the land surface is recorded, and any changes indicate land deformation. Typically extensometers are paired with groundwater monitoring wells in order to relate changes in groundwater elevation associated with groundwater extraction to changes in the expansion or contraction of the subsurface. No extensometers exist in the vicinity of the City of Vacaville, nor in Solano County. The nearest extensometer is in Yolo County, at the Conaway Extensometer site 15 miles northeast of the DIXN CORS site; this site is

[4] There is no evidence to suggest that this amount of land subsidence indicates inelastic or elastic subsidence conditions. Further evaluation would be necessary to determine the nature of the subsidence seen at that location.

maintained by the California Department of Water Resources (DWR)[5]. Records from this site indicate a rate of land subsidence of approximately 0.0588 ft/year between 1992 and 2013 occurring between land surface and 716 feet below ground surface; more recent extensometer data reflect greater depths to water resulting in much greater rates of subsidence at this location. The average rate of land subsidence for 2014 and 2015 is approximately 0.7003 ft/year. The average annual rate of subsidence at the Conaway extensometer site for its entire period of record from 1992 to present (0.1123 ft/year) is higher than those observed as land surface elevation declines in CORS sites in the Solano County area described in Table 3-3 above.

#### *3.1.3.4 SCWA CGPS Stations and Groundwater Level Data*

Groundwater levels reflect changes in climate in addition to anthropogenic influences including pumping. Groundwater levels and land surface elevations can sometimes be correlated depending on the depth of the well and the unit(s) responsible for subsurface compaction and/or expansion. **Figures 2-23** and **2-24** show the trends in land surface elevation and corresponding groundwater monitoring well water levels at the DIXN and VCVL sites. At the DIXN site, the monitoring well completed at 2,212 feet below ground surface (SCWA-Dixon MW-2212) exhibits the same seasonal trend seen in the land surface elevation changes (**Figure 2-23**). For the DIXN site, the land surface elevations were plotted with those at site P267 in order to provide a longer period of record to compare the groundwater levels to, since the trends in P267 are most similar to those seen at the DIXN site. Recent drought conditions are exhibited in the groundwater elevations in this well, showing lower spring groundwater elevations in 2014 and 2015. The land surface shows similar seasonal fluctuations, but exhibits full recovery in the spring[6].

The land surface trends at the VCVL site are similar to groundwater levels at the monitoring well completed at 1,430 feet below land surface (MW16-1430) (**Figure 2-24**). For the VCVL site, the land surface elevations are complemented by those at CORS site P266, since trends in measurements at this site are similar to the shorter period of record at VCVL. The land surface data and the groundwater elevations show stable to slightly decreasing elevation conditions.

Groundwater monitoring efforts are a critical component of managing water resources in and around the City of Vacaville. Monitoring land subsidence paired with groundwater level measurements leads to a deeper understanding about the water resource and the general conditions of the aquifer underlying the City of Vacaville. There is land subsidence occurring in and around Solano County, though at relatively low rates (between 0.00195 to 0.03238 ft/year, or 0.594 to 9.869 mm/year) over about the last 11 years. Further evaluation would be needed to determine: a) whether this subsidence is elastic or inelastic, and b) which subsurface unit or units are responsible for the compaction. Additional investigation will also help assess what affects groundwater pumping activities are having on land subsidence. The dewatering of clays can take decades to occur, long after reductions in pumping may alleviate groundwater level elevations in particular aquifer units. This means that land subsidence may continue to occur long into the future due to historical pumping stresses. Continuous GPS combined with water level data can be used for an analysis of stress and strain, which can make it possible to compute the elastic and inelastic subsidence components. The VCVL subsidence monitoring station will

[5] Conaway Extensometer data can be downloaded from DWR's Water Data Library at http://www.water.ca.gov/waterdatalibrary/docs/Hydstra/index.cfm?site=09N03E08C004M

[6] The inability of groundwater levels in Dixon MW-2212 to recover from seasonal lows during a drought period is common. The relationship seen in the land surface indicates that there is little to no subsidence at this location due to declining groundwater levels.

prove to be an excellent tool for continuous management of the groundwater resource beneath the City of Vacaville.

### 3.1.4 SGMA and CASGEM

In September 2014, the California Legislature passed the Sustainable Groundwater Management Act (Act). SGMA changes how groundwater is managed in the state. SGMA defines "sustainable groundwater management" as the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results (Section 10721 (u)). Undesirable results, as defined by SGMA, means one or more effects caused by groundwater conditions occurring throughout the basin (Section 10721 (w)).

SGMA applies to basins or subbasins that DWR designates as medium- or high-priority basins. Previously under the California Statewide Groundwater Elevation Monitoring Program (CASGEM), DWR classified California's groundwater basins and subbasins as either high, medium, low, or very low priority (Section 10933). The priority classifications are based on eight criteria that include the overlying population, the reliance on groundwater, and the number of wells in a basin or subbasin. In Solano County, the Solano Subbasin was ranked medium priority. The Suisun-Fairfield Valley Basin was ranked as very low-priority.

For most basins designated by DWR as medium or high priority, SGMA requires the designation of groundwater sustainability agencies (GSA) and the adoption of groundwater sustainability plans (GSP); however, there is an alternative to a GSP, provided that the local entity (entities) can meet certain requirements. When required, GSPs must be developed to eliminate overdraft conditions in aquifers and to return them to a condition that assures their long-term sustainability within twenty years of GSP implementation. SGMA does not require the development of a GSP for basins that DWR ranks as low- or very low-priority basins; GSPs are voluntary for these basins.

As applicable, SGMA requires that a GSA be identified for medium- and high-priority groundwater basins by June 30, 2017. Counties are presumed to be the GSA for unmanaged areas of medium and high priority basins (Section 10724). However, counties are not required to assume this responsibility. When no entity steps forward, this can lead to state intervention (Section 10735 *et seq*.).

SGMA requires GSAs for medium- and high-priority basins to adopt a GSP by January 31, 2022 (Section 10720.7). For basins subject to critical overdraft conditions, the GSP must be adopted by January 31, 2020. Upon adoption of a GSP, the designated GSA must submit the GSP to DWR for review. SGMA requires that DWR develop regulations for evaluating GSPs by June 1, 2016. On February 18, 2016, DWR released draft GSP regulations. The public comment period for the draft GSP regulations is set to close on April 1, 2016.

In addition to imposing a number of new requirements on local agencies related to groundwater management, SGMA also provides for state intervention – a "backstop" – when local agencies are unwilling or unable to manage their groundwater basin (Section 10735 *et seq*.).

Upon completion of its review of a GSP, DWR has the power to request changes to the GSP to address deficiencies. DWR is required to re-evaluate GSPs every five years to ensure continued compliance and sufficiency. After adoption of a GSP, the GSA must submit to DWR an annual compliance report containing basin groundwater data, including groundwater elevation data, annual aggregated extraction data, surface water supply for or available for use for groundwater recharge or in-lieu use, total water use, and any changes in groundwater storage (Section 10728).

Solano County is currently conducting outreach to stakeholders and seeking input from the County Board of Supervisors while preparing for multiple paths forward pending the content of the final GSP regulations.

On November 4, 2009 the State Legislature amended the Water Code with SBx7-6, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. To achieve that goal, the amendment requires collaboration between local monitoring entities and Department of Water Resources (DWR) to collect groundwater elevation data. Collection and evaluation of such data on a statewide scale is an important fundamental step toward improving management of California's groundwater resources. In accordance with this amendment to the Water Code, DWR developed the CASGEM program. The City of Vacaville cooperates with Solano County Water Agency (the designated Monitoring Entity for the Solano Subbasin) by coordinating and reporting water level data for a network of 11 monitoring wells within the City on a semi-annual basis. This network of wells includes 7 monitoring wells screened in the Basal Tehama, 2 monitoring wells in the Upper Tehama, and 2 monitoring wells in the Quaternary Alluvium/Upper Tehama.

| Local Well Designation | Aquifer Designation |
|---|---|
| MW-98A | Basal Tehama |
| MW-98B | Basal Tehama |
| MW-98C | Basal Tehama |
| DeMello MW-95ft | Quaternary Alluvium |
| MW-14 | Basal Tehama |
| MW-15-188ft | Quaternary Alluvium/Upper Tehama |
| MW-15-508ft | Upper Tehama |
| MW-15-1815ft | Basal Tehama |
| MW-16-117ft | Upper Tehama |
| MW-16-1166ft | Basal Tehama |
| MW-16-1430ft | Basal Tehama |

### 3.1.5 Considerations for Additional Groundwater Development

Constituents such as total chromium and hexavalent chromium are naturally occurring throughout the state of California, including Solano County and nearby Yolo County. California has established an MCL for total chromium of 50 µg/L, while at the federal level USEPA has established a higher MCL for total chromium of 100 µg/L. On July 1, 2014, a new MCL for hexavalent chromium of 10 µg/L became effective in California. This presents a challenge for the development of new groundwater supplies in regions such as northern Solano County where total chromium and hexavalent chromium are naturally present in groundwater.

The City of Vacaville water supply well and monitoring well data, complemented by other local area data, suggest that there are some potential factors that contribute to the occurrence and distribution of total chromium and hexavalent chromium in groundwater in northern Solano County. This information, together with site-specific conditions at sites where new groundwater development is planned to occur (e.g., between the City boundary and eastward to the urban growth boundary, **Figure 3-1**), will be important to minimize chromium concentrations.

Historically, the City has successfully managed its surface water and groundwater supplies. Through managed utilization of both surface water and groundwater resources, including the planned distribution of groundwater pumping in the basal zone of the Tehama Formation, groundwater levels associated with local pumping depressions have been managed and have remained stable relative to "base year" groundwater conditions established in 1992-1993 for the Elmira well field area.

Groundwater monitoring efforts are a critical component of managing water resources in and around the City of Vacaville. Monitoring land subsidence paired with groundwater level measurements leads to a deeper understanding about the water resource and the general conditions of the aquifer underlying the City of Vacaville. There is land subsidence occurring in and around Solano County, though at relatively low rates (between 0.00195 to 0.03238 ft/year, or 0.594 to 9.869 mm/year) over about the last 11 years. It will be important as new groundwater supplies are developed in northern Solano County to optimize the locations selected for new wells in order to minimize groundwater level declines, particularly to ensure groundwater levels remain at elevations above historical levels to avoid the potential for land subsidence.

### 3.1.6 Groundwater Development – Current and Future

An analytical groundwater flow model was created and used to assess water level impacts from current demands and future increases in groundwater pumpage by the City of Vacaville to meet future water demands. The model was developed to simulate the incremental increase in drawdown in the northern Solano County area in response to groundwater pumpage for several different scenarios. The model is based on the Hantush-Jacob (1955) groundwater equation, which calculates drawdown in a confined aquifer that allows for leakage from overlying subsurface materials. The model allows for incorporating well cycling on and off within one day and also seasonal pumping variations.

The model was calibrated using a period from January to December 2006, as this period had sufficient water level measurements, and the availability of data from production and monitoring wells outside of the Elmira Road well field was sufficient. The full details about the analytical model and all of the various future scenarios are included in **Appendix B**. The future scenarios developed initially are still pertinent to City planning with the future projected City groundwater pumpage for 2020, 2025, 2030, 2035, and 2040 for normal and dry years (**Table 3-4**). **Appendix B** contains two tables, **Table B-2** and **Table B-3** that summarize the simulated drawdown results for pumping at levels similar to those projected for 2020-2040. This work applies to the 2020 to 2040 projected pumpage and supply sufficiency extrapolated and the only difference would be localized water level changes (e.g., cone of depression) around the new well location. The analytical model results indicate that there is sufficient water for the proposed future increased demand. Although the analytical model places future production wells in the north and northeast, the results of the analytical model are relevant if the exact location of future production wells varies slightly. A new analysis of well interference, water level drawdown, and water quality implications would be performed on any new production wells considered for installation. For purposes of discussion of groundwater supply sufficiency for current and future demands, the analytical model remains an applicable tool. A discussion of the simulated drawdown results of projected pumping amounts similar to those prepared originally for 2015-2035 is found in **Appendix B, Section B.2.1**.

**Table 3-4**
**Basal Zone Pumping for Analytical Model Inputs and Projected City Demands**

| Original Model Year | City Basal Pumping (AFY) – Normal Year | City Basal Pumping (AFY) – Dry Year | Projected Year | City Basal Pumping (AFY) – Normal Year | City Basal Pumping (AFY) – Dry Year |
|---|---|---|---|---|---|
| 2015 | 6,850 | 8,220 | 2020 | 6,900 | 8,220 |
| 2020 | 6,850 | 8,220 | 2025 | 7,200 | 8,640 |
| 2025 | 7,200 | 8,640 | 2030 | 7,600 | 9,060 |
| 2030 | 7,550 | 9,060 | 2035 | 8,000 | 9,600 |
| 2035 | 8,000 | 9,600 | 2040 | 8,000 | 9,600 |

# 4 SUMMARY OF GROUNDWATER SOURCE SUFFICIENCY

## 4.1 GROUNDWATER SUPPLY SUFFICIENCY FOR 2020-2040

The analytical model results generally show that water levels in the Elmira Road well field for all future scenarios would be similar to or higher than the 2006 baseline scenario results. It appears that groundwater (from the non-basal and basal zones of the aquifer system) can be used by the City on a sustained basis at an amount of about 8,000 acre-feet (including basal and non-basal zone pumpage) to meet normal year demands through 2040. On a short-term basis for a single-dry year condition, basal and non-basal zone pumpage up to 9,700 acre-feet, pending the pumpage distribution, would result in increased water level drawdown, especially in year 2020, but water level drawdown in the Elmira area is anticipated in future years (2020 to 2040) to become comparable to that simulated with the 2006 baseline scenario. Correspondingly, as more groundwater development occurs in future years in the urban growth boundary, the drawdown increases.

Based on available data and the model results, annual groundwater pumpage for normal, single-dry, and multiple-dry year types are summarized in **Table 4-1**.

**Table 4-1**
**City of Vacaville**
**Groundwater Supply Sufficiency Years 2020-2040[1]**

| Water Supply Year | Normal Year (acre-feet/year) | Single-Dry Year (acre-feet/year) | Multiple-Dry Year (acre-feet/year) |
|---|---|---|---|
| 2020 | 7,000 | 8,300 | 8,300 |
| 2025 | 7,300 | 8,700 | 8,700 |
| 2030 | 7,700 | 9,200 | 9,200 |
| 2035 | 8,100 | 9,700 | 9,700 |
| 2040 | 8,100 | 9,700 | 9,700 |

1. *Groundwater quantities include non-basal and basal pumpage.*

As shown on **Table 4-1**, the total normal year sustained pumpage amount for the City is projected to increase from 7,000 acre-feet in 2020 to 8,100 acre-feet by 2040. The single-dry year pumpage increases from 8,300 acre-feet in 2020 to 9,700 acre-feet by 2040. The pumpage levels shown in **Table 4-1** for multiple-dry years are recommended based on the available monitoring data and current understanding of the response of the aquifer system to pumping stresses. The multiple-dry year pumpage levels range from 8,300 acre-feet in 2020 to 9,700 acre-feet in 2040. The likely impact of this level of pumpage for multiple years is still unknown because the model does not simulate recharge variations necessary for multi-year simulations. When pumpage at these amounts occurs over a multiple-dry year period, it is recommended that the portion of the pumpage occurring in the Elmira Road well field be limited (at least initially) to about 5,100 acre-feet, or about 10 percent above the presently identified level of sustained pumpage for that area (about 4,600 acre-feet based on 2006 baseline scenario results, **Table B-2**). Total City pumpage for multiple-dry year periods would thus be comprised of basal pumpage from the Elmira Road area; City Wells 14 through 16 and other new wells; and also non-basal pumpage from Well 1. As new City wells are constructed (**Figure 3-1**), more is known about the nature of the aquifer system, and further analysis occurs with the use of a numerical groundwater model, then the additional information (particularly information about spring water level recovery in the northern portion of the study area) will allow further determination of the pumpage that can be sustained during single-dry year and multiple-dry year periods.

## 4.2 CITY'S CONJUNCTIVE WATER MANAGEMENT AND MONITORING PROGRAM

Maximizing the groundwater supply without causing significant impacts requires distribution of pumpage to prevent excessive water level drawdown and to ensure that persistent water level declines do not occur. Conjunctive water management of surface and groundwater has allowed groundwater levels to recover in the Elmira Road area to base year water levels.

Although short-term pumpage by the City at amounts of 9,700 acre-feet, or possibly more, is possible during single-dry year or multiple-dry year periods, analysis of existing data indicates that this level of pumpage would increase significantly the maximum (or summertime) drawdown in the northeastern county area. The conjunctive water management plan which is being employed by the City would be used to reduce drawdown during normal and wet water years. Specifically, short-term pumpage occurring at increased levels to meet demand during dry years would be offset in subsequent years through a corresponding reduction in pumpage and increased utilization of surface-water supplies.

Continued groundwater level monitoring is important for ensuring that when pumpage is increased for multiple dry-year periods, levels, particularly in the Elmira Road well field, do not drop below historical low levels during summer months and recover to base year spring levels after the dry period is over. Continuation of the groundwater monitoring program is described in the City's *Groundwater Management Plan Update* (LSCE, 2011). The amount of pumpage considered to be sustainable may change in the future as a result of ongoing evaluation of monitoring data, managed extraction from the basal zone, continued application of conjunctive water management, and further analysis of the pumpage that can be sustained during dry-year periods by the creation and implementation of a numerical model.

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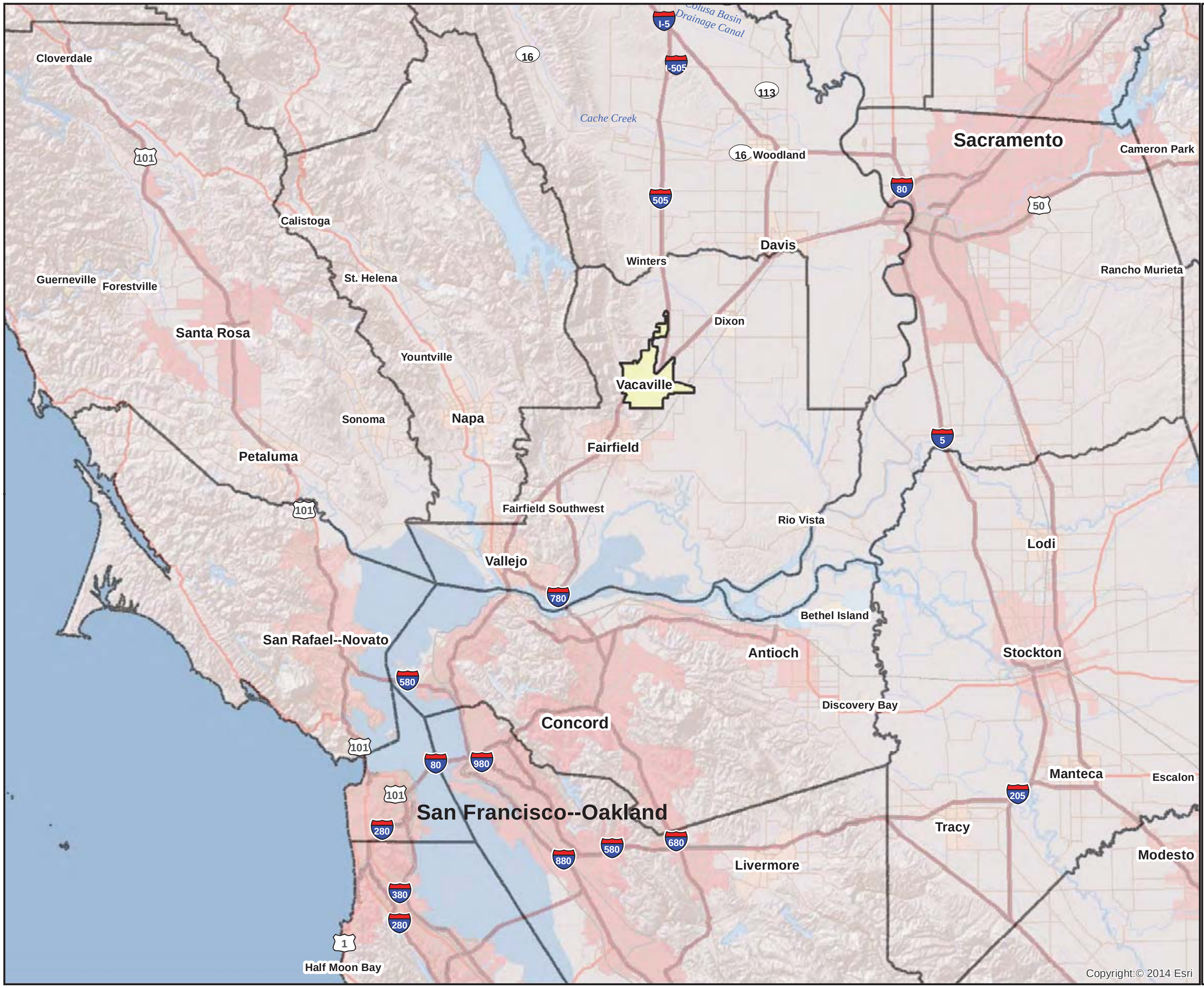
# FIGURES



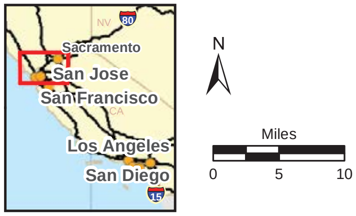




**Figure 1-1**
**City of Vacaville**
**Location Map**

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

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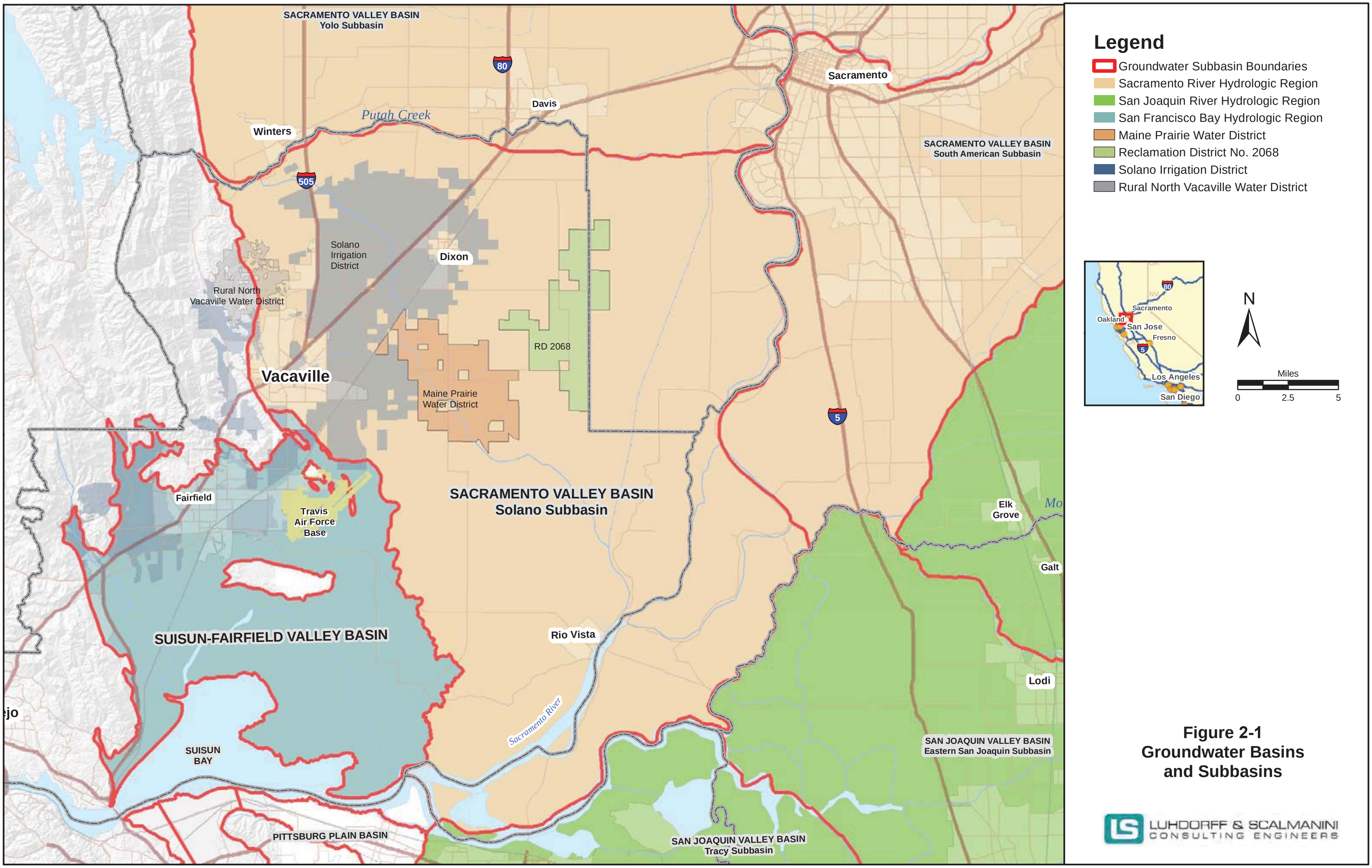


**Figure 2-1**
**Groundwater Basins and Subbasins**

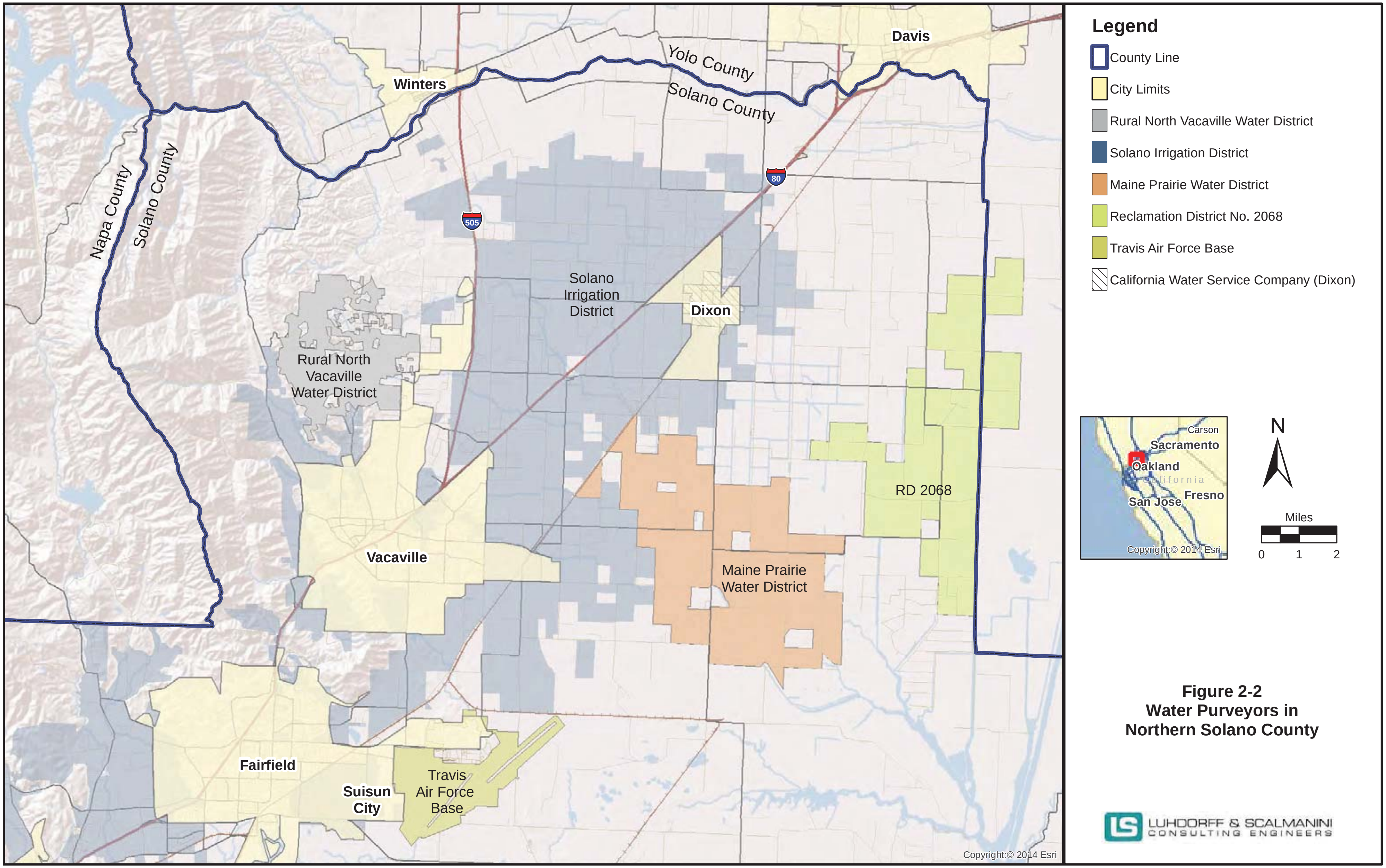


**Figure 2-2**
**Water Purveyors in Northern Solano County**

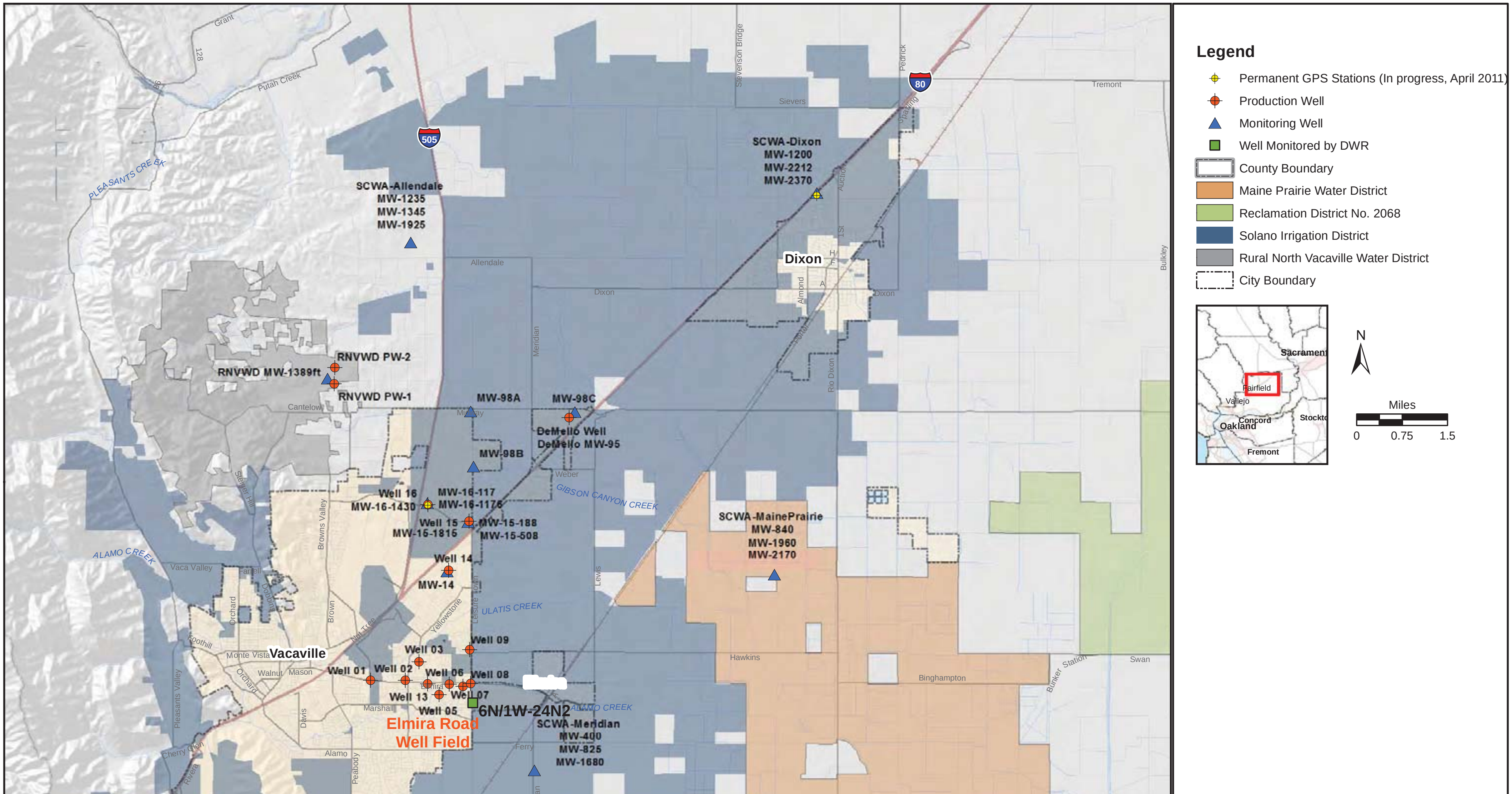


**Figure 2-3**
**Location Map with Groundwater Monitoring Facilities**

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

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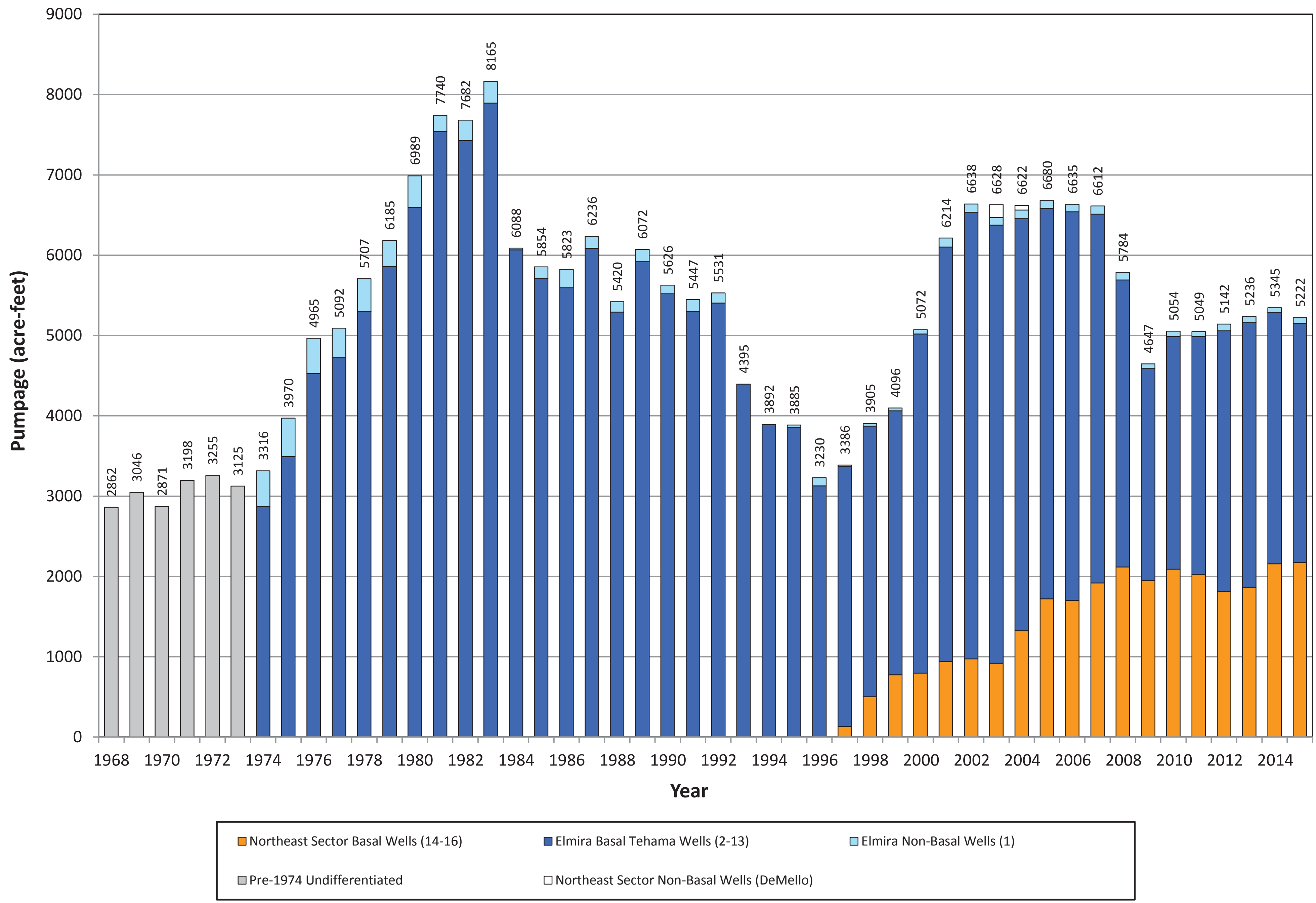


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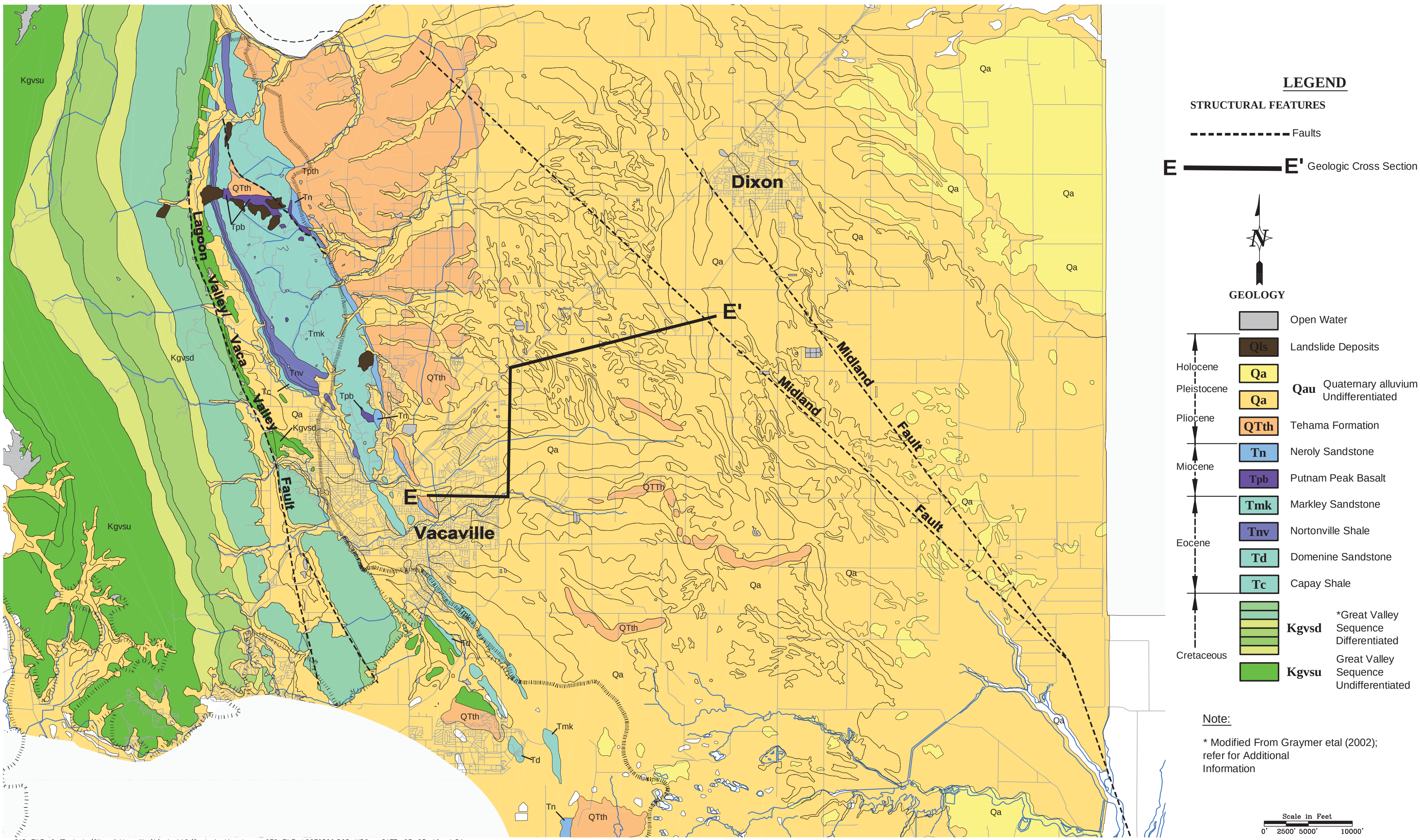
**Figure 2-4**
**City of Vacaville Annual Groundwater Pumpage**

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LUHDORFF & SCALMANINI CONSULTING ENGINEERS

**Figure 2-5**
**Surficial Geologic Map of Solano County**

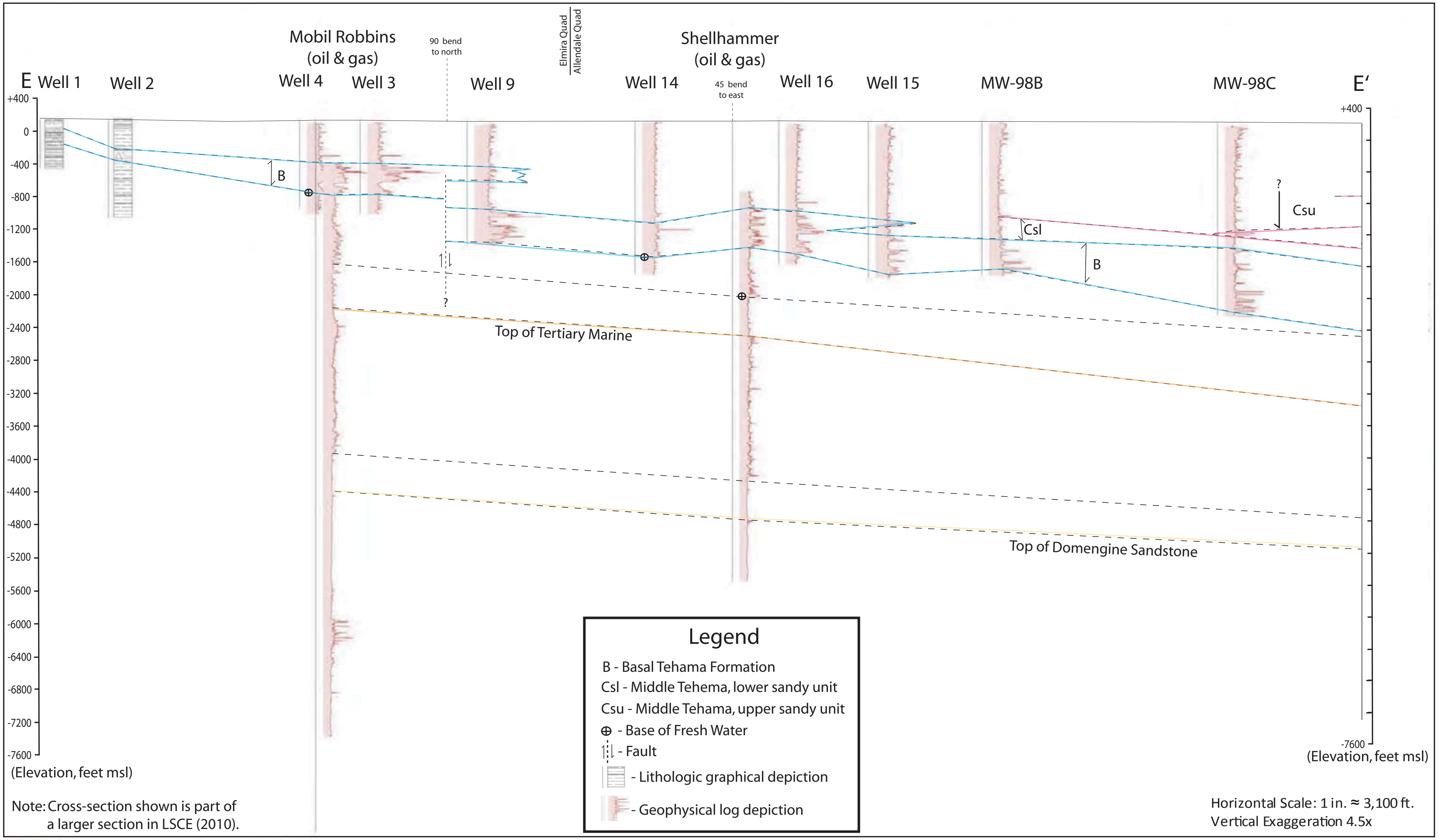


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**Figure 2-6**
**Cross-Section E-E'**

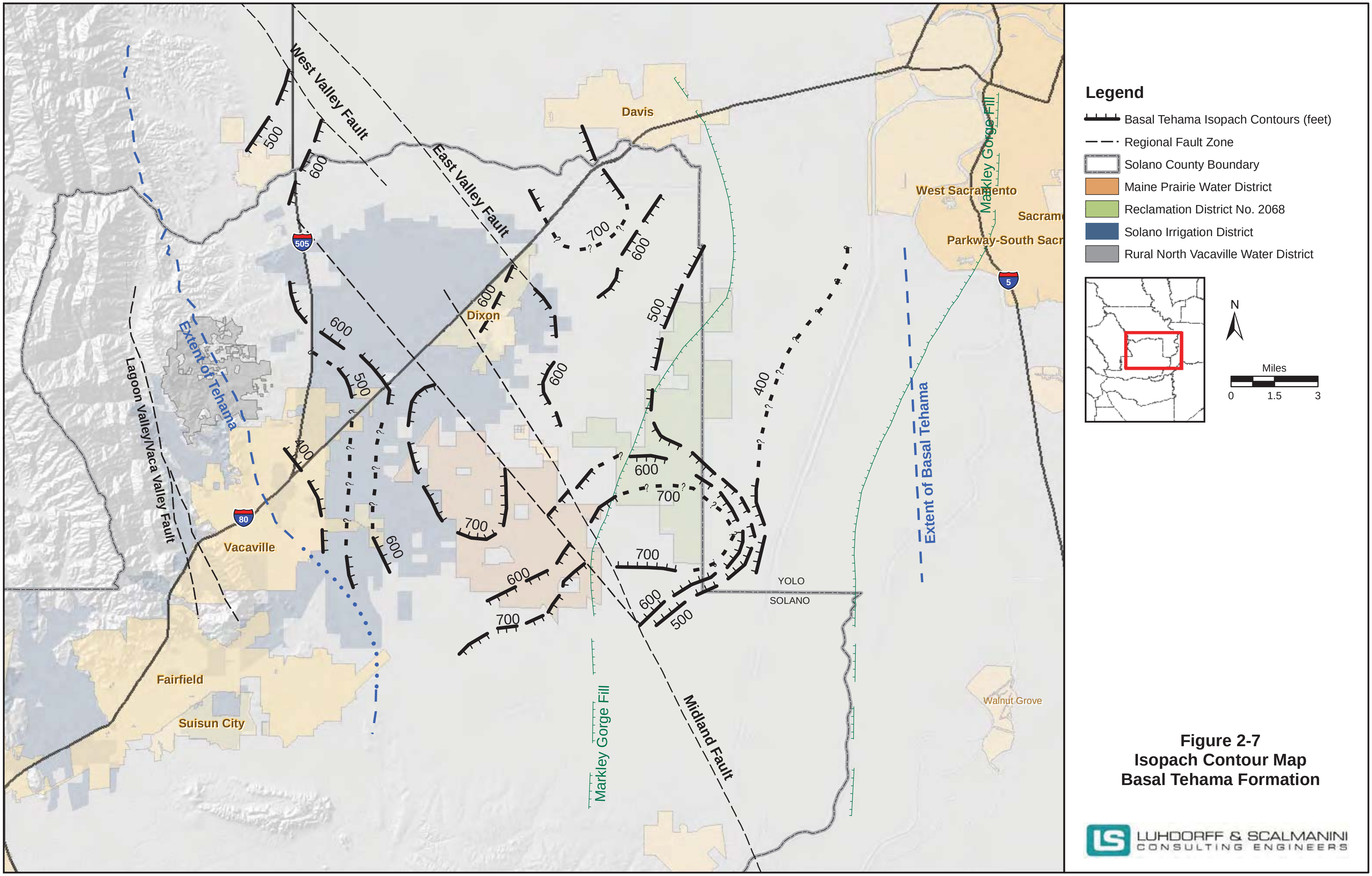


**Figure 2-7**
**Isopach Contour Map**
**Basal Tehama Formation**

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CONSULTING ENGINEERS

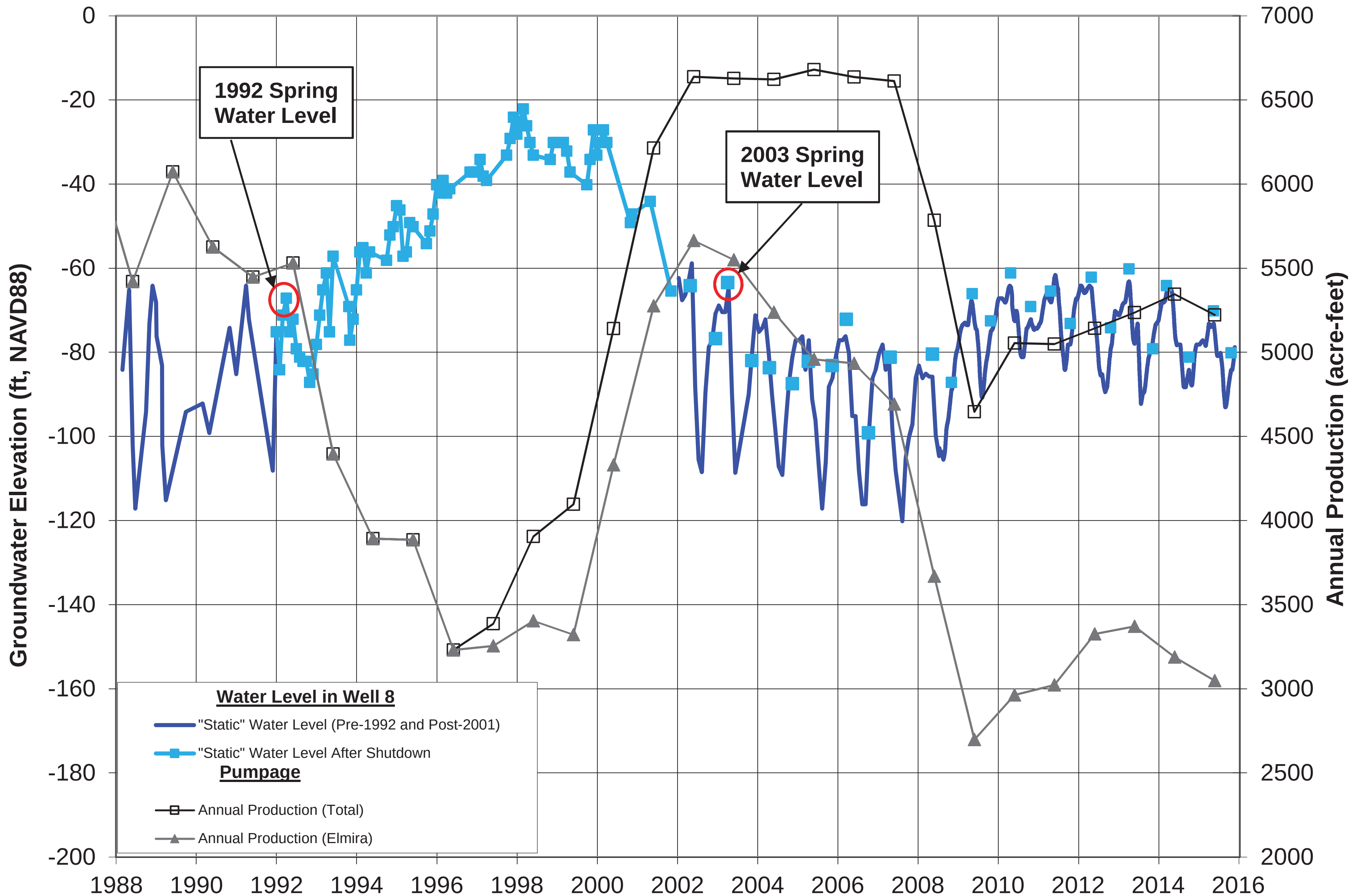


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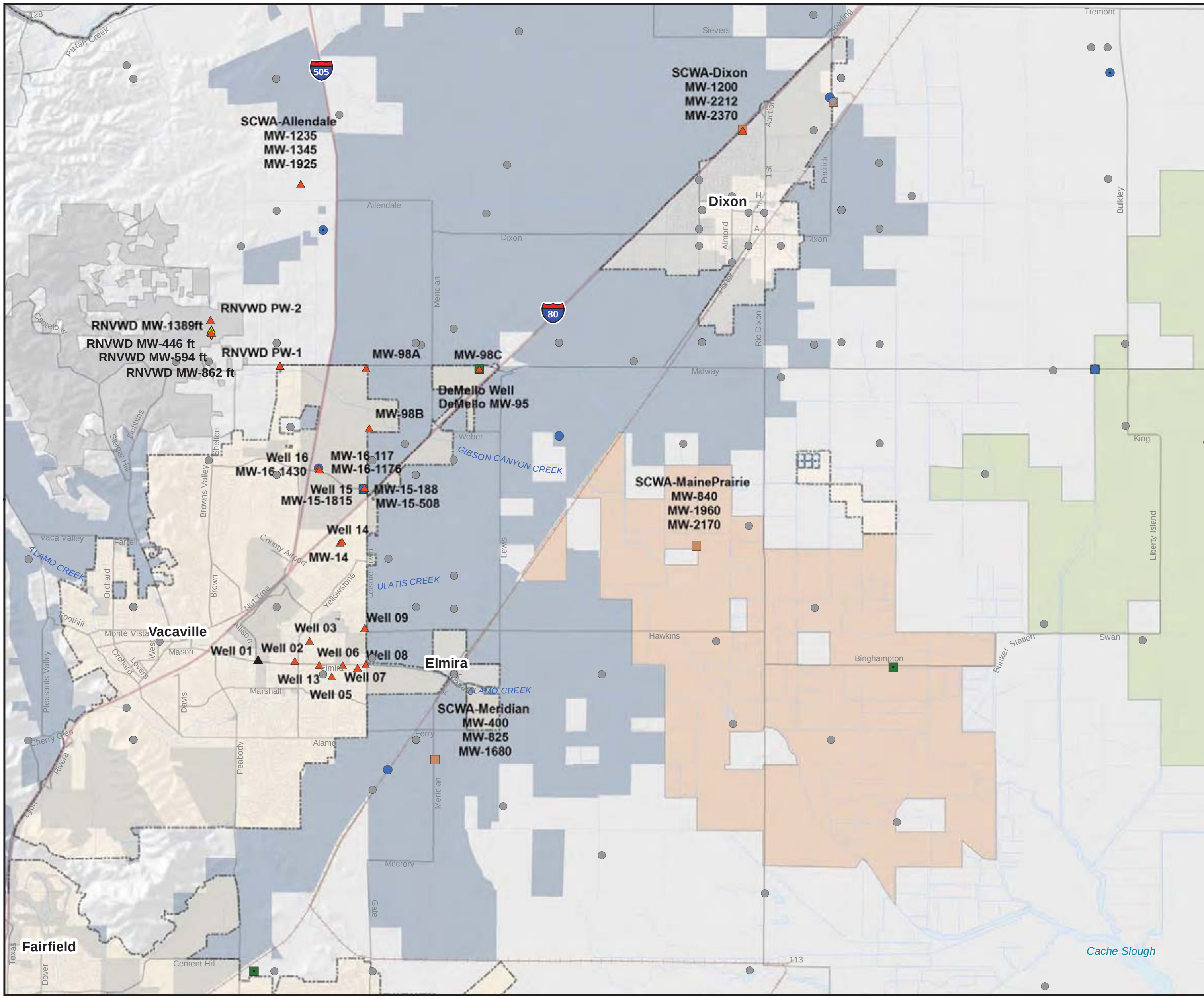
**Figure 2-8**
**Groundwater Level Hydrograph**
**City of Vacaville Well 8 and Total Annual Production**




## Legend

**Well Location (by Aquifer Zone)***

- Quaternary Alluvium
- Upper Tehama
- Middle Tehama
- Basal Tehama
- Tehama (general)
- Markley Formation
- Unknown
- County Boundary
- City Boundary
- Maine Prairie Water District
- Reclamation District No. 2068
- Solano Irrigation District
- Rural North Vacaville Water District

**Wells screened in multiple zones are shown as the primary/major zone and indicated with a black dot in the center of the symbol.*


N

Miles
0 0.75 1.5

**Figure 2-9**
**Location Map for Wells with Water Quality**

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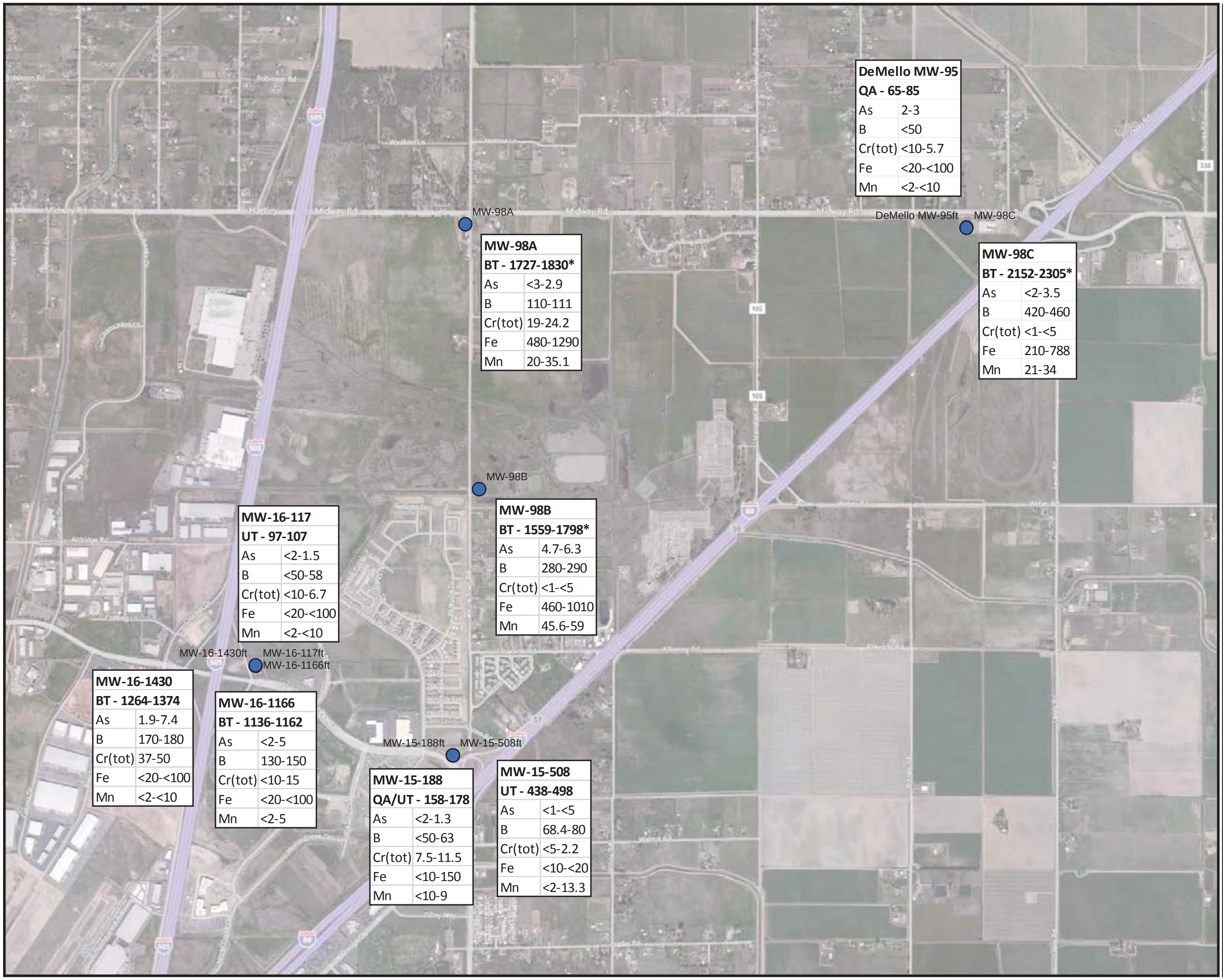


**Legend**

**City of Vacaville**

● Monitoring Well Location with Aquifer Unit, Screen Depths (ft), and WQ Data (concentration units ug/L)

Notes:
QA - Quaternary Alluvium;
UT - Upper Tehama;
BT - Basal Tehama
* indicates multiple screen openings within the range listed

N

0 0.25 0.5 1
Miles


**Figure 2-10**
**Select Groundwater Quality Contituents**

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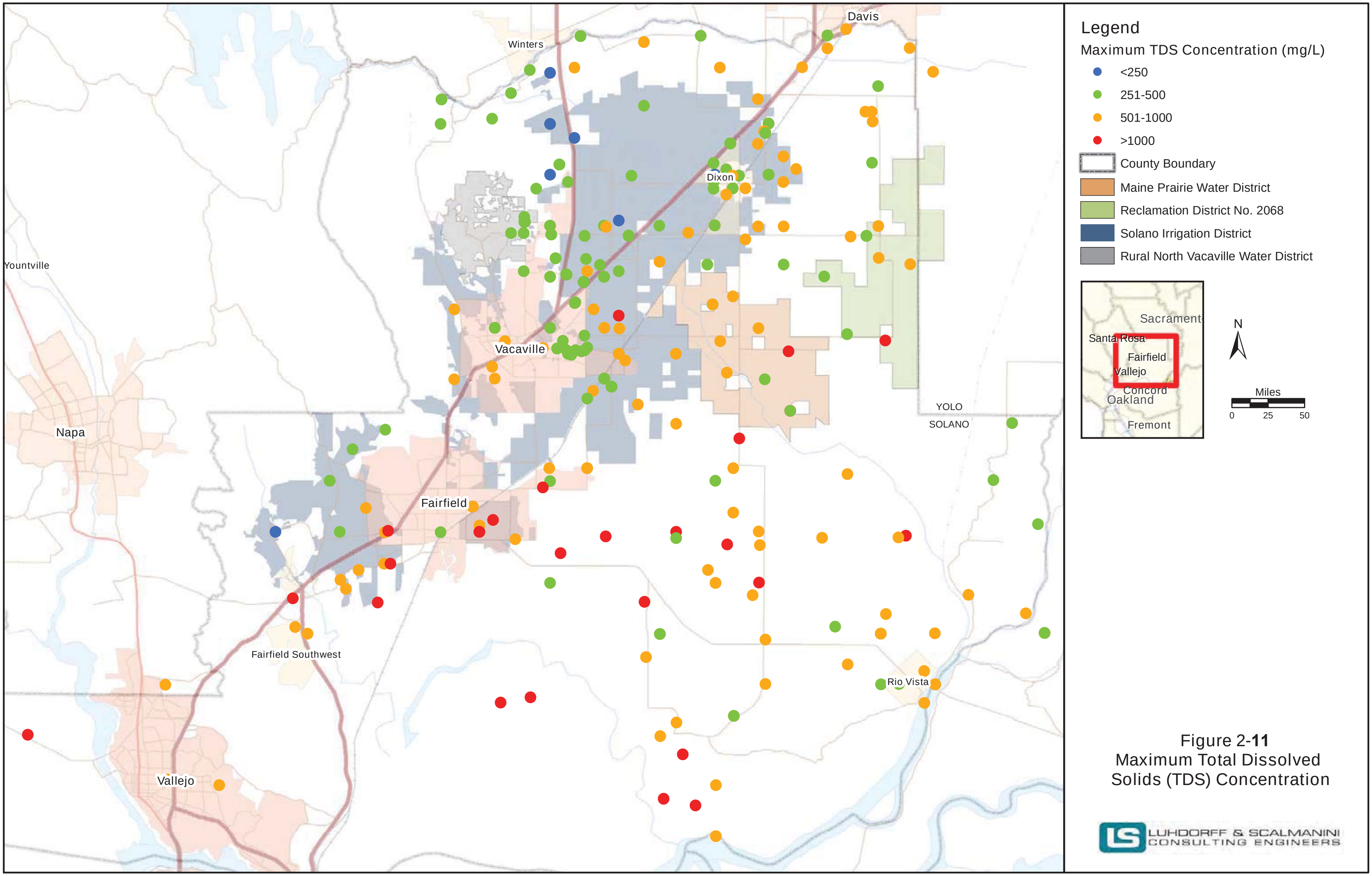


Figure 2-11
Maximum Total Dissolved Solids (TDS) Concentration

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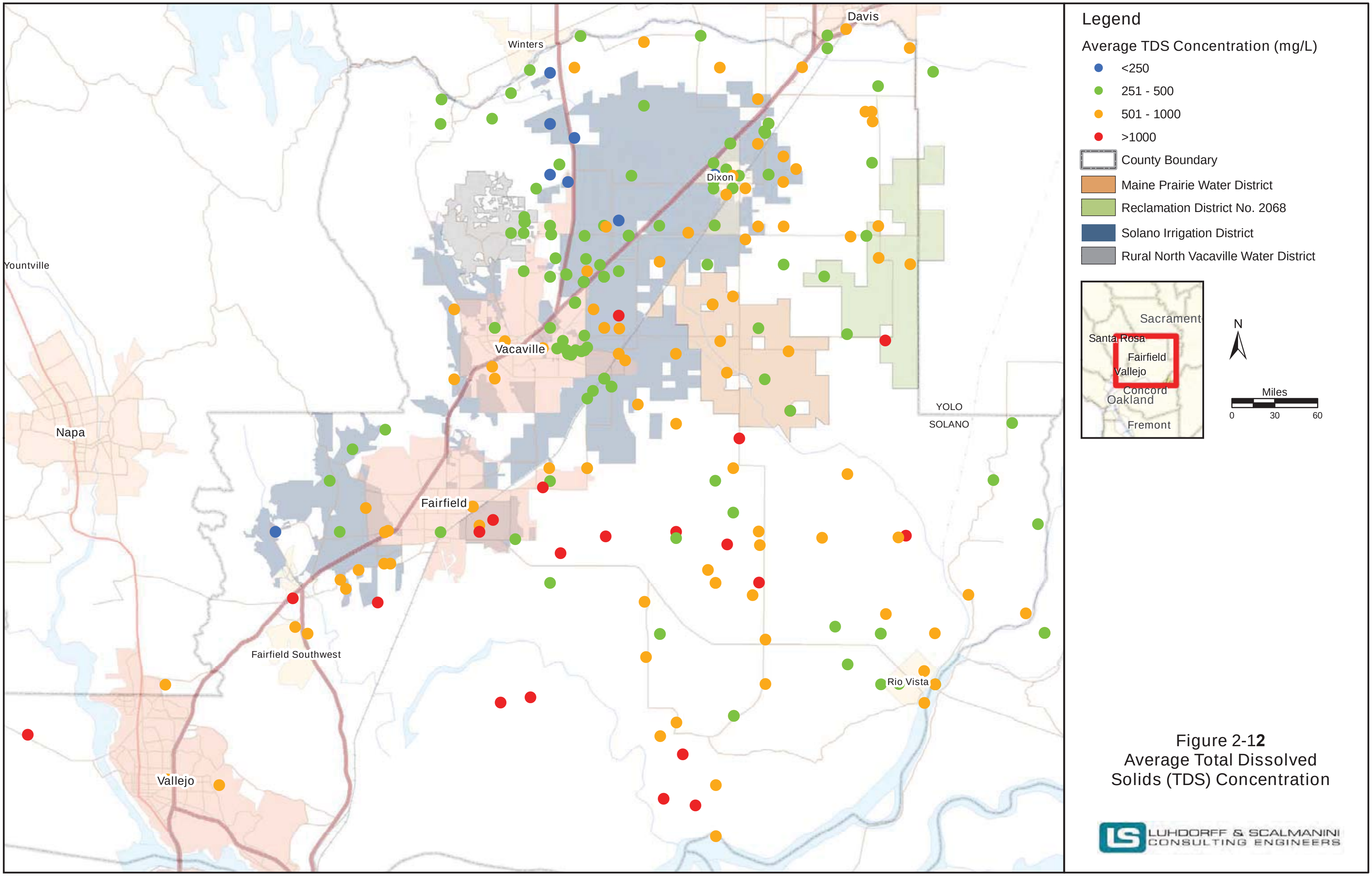


Figure 2-12
Average Total Dissolved
Solids (TDS) Concentration

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CONSULTING ENGINEERS

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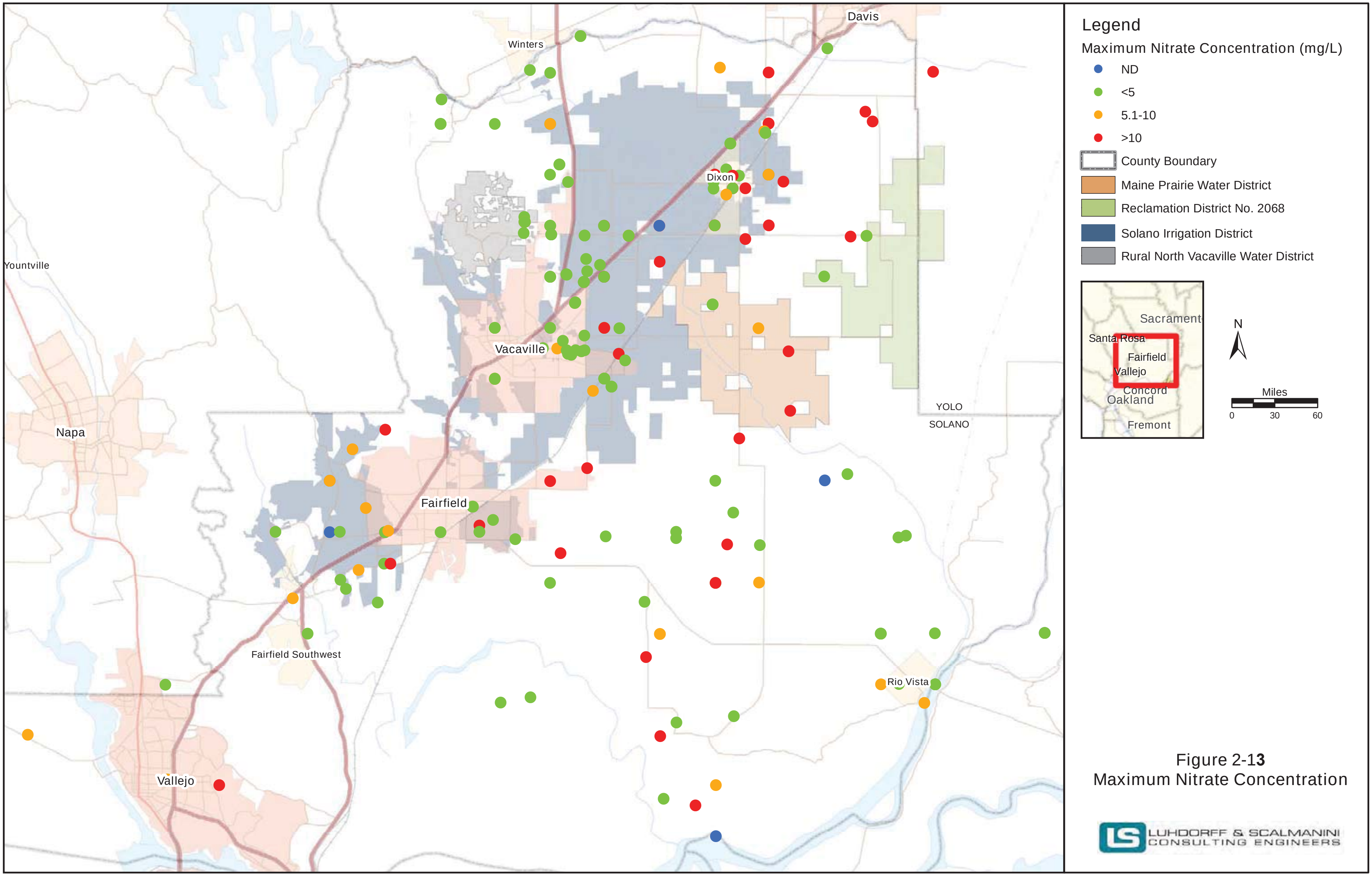


Figure 2-13
Maximum Nitrate Concentration

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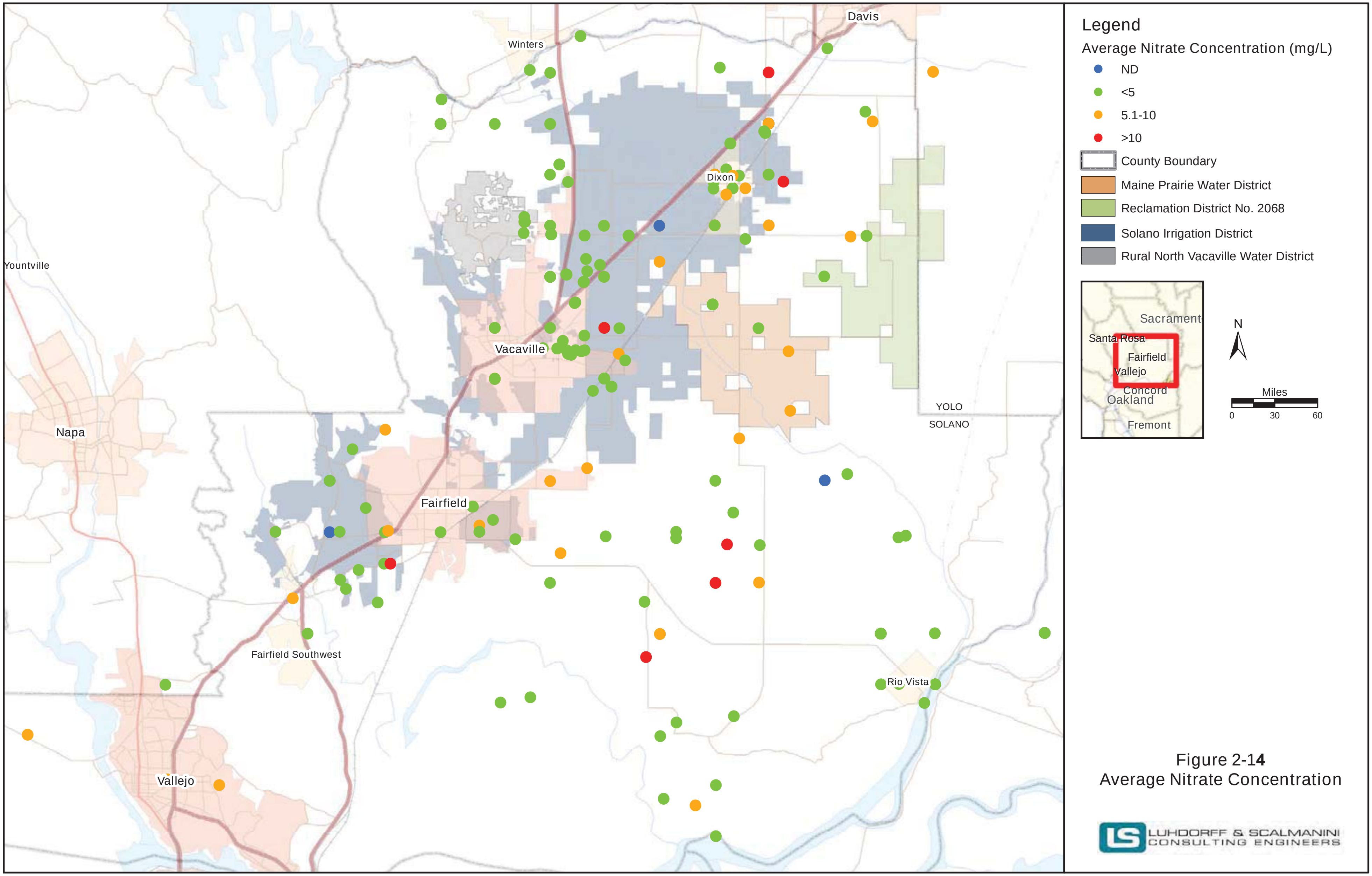


Figure 2-14
Average Nitrate Concentration

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

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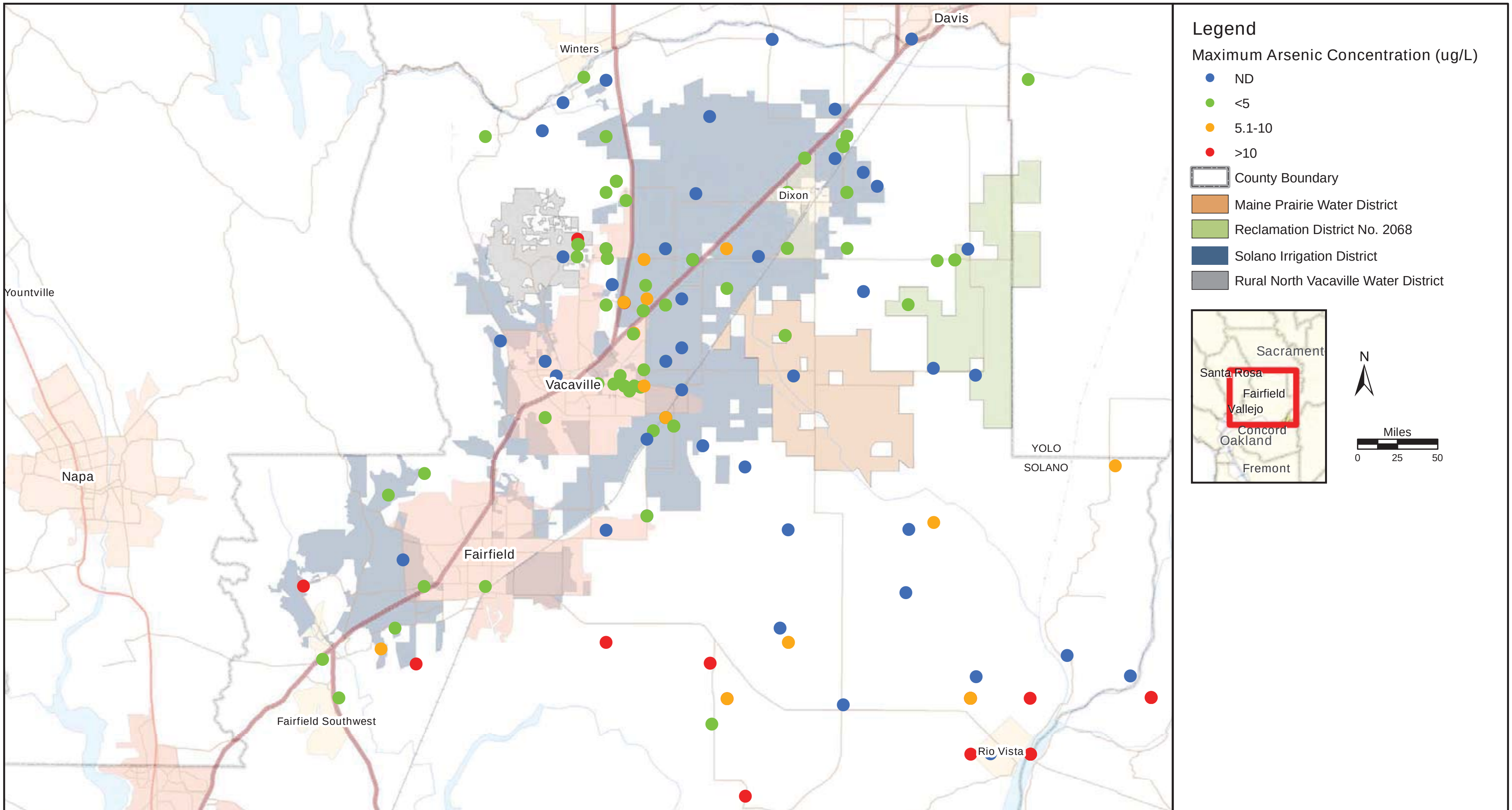


Figure 2-15
Maximum Arsenic Concentration

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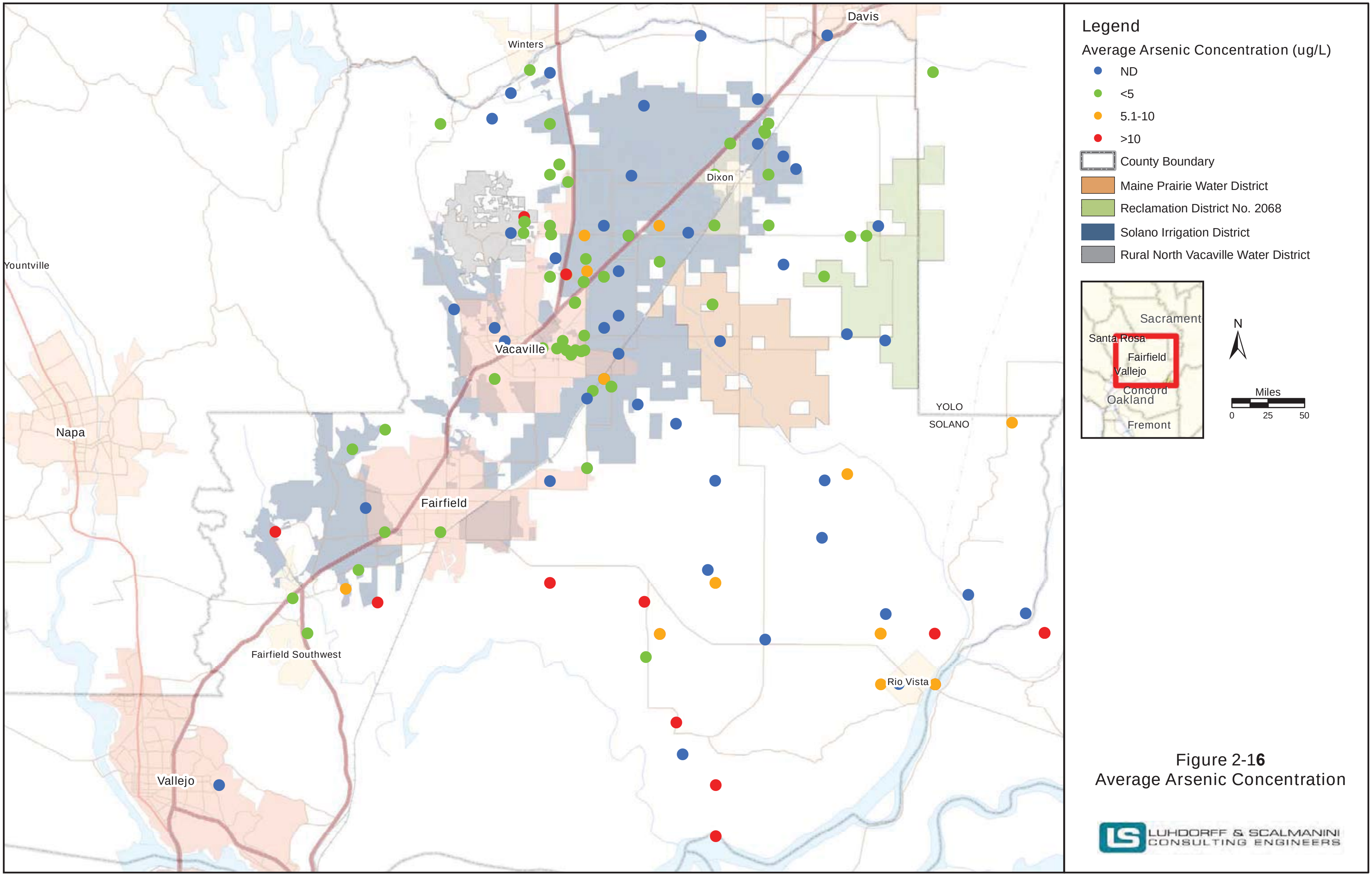


Figure 2-16
Average Arsenic Concentration

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

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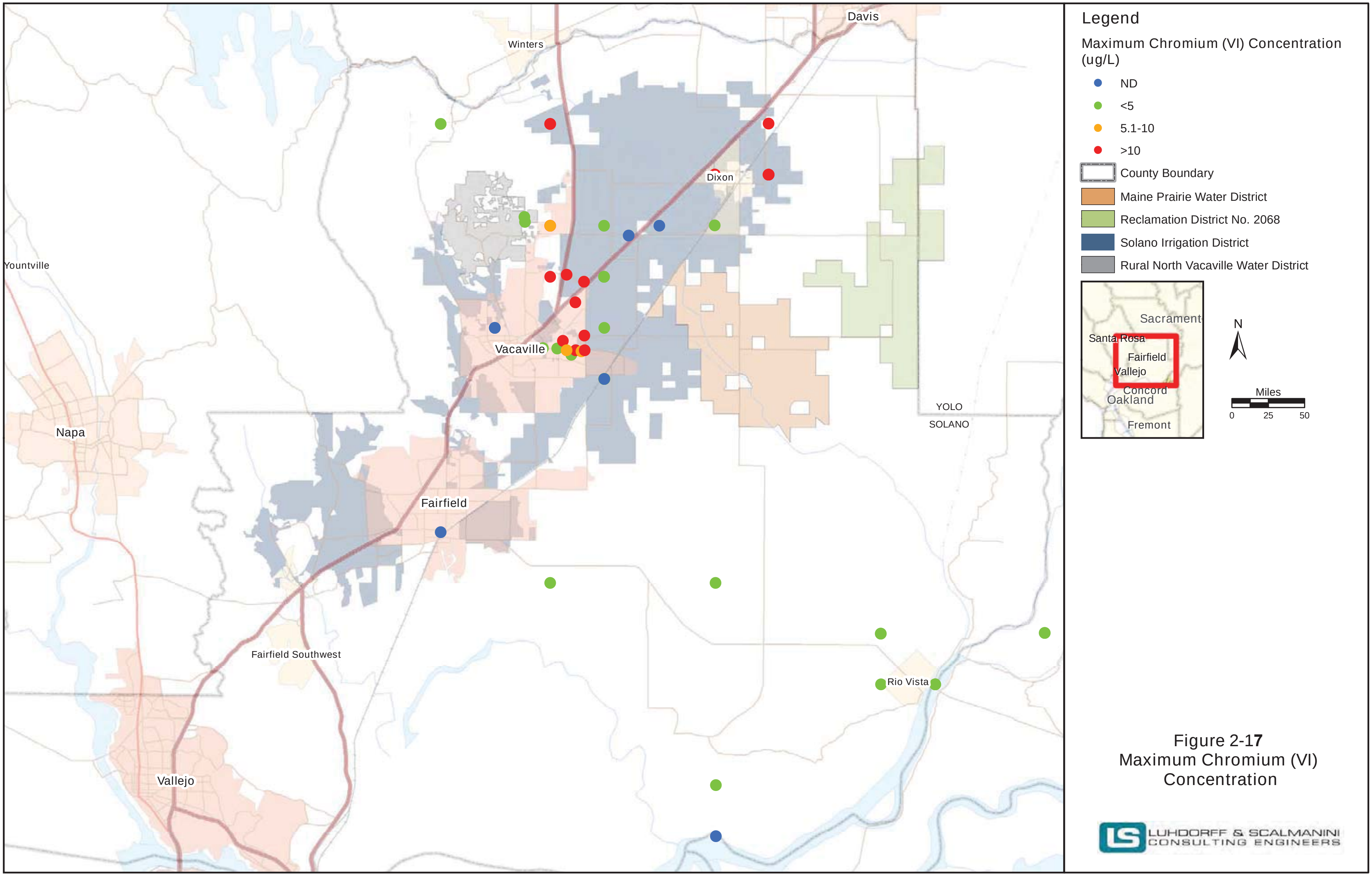


Figure 2-17
Maximum Chromium (VI) Concentration

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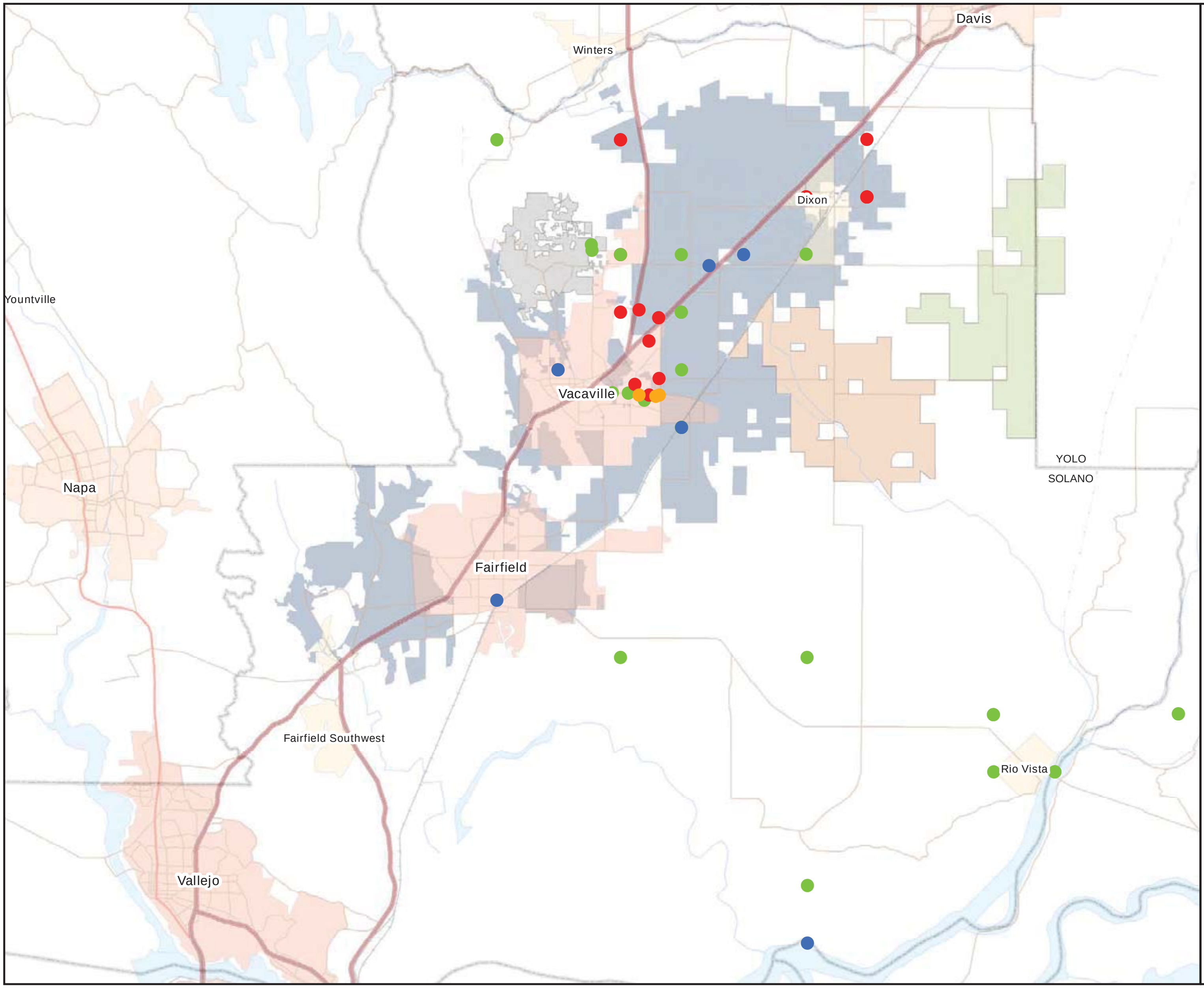


Figure 2-18
Average Chromium (VI) Concentration

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

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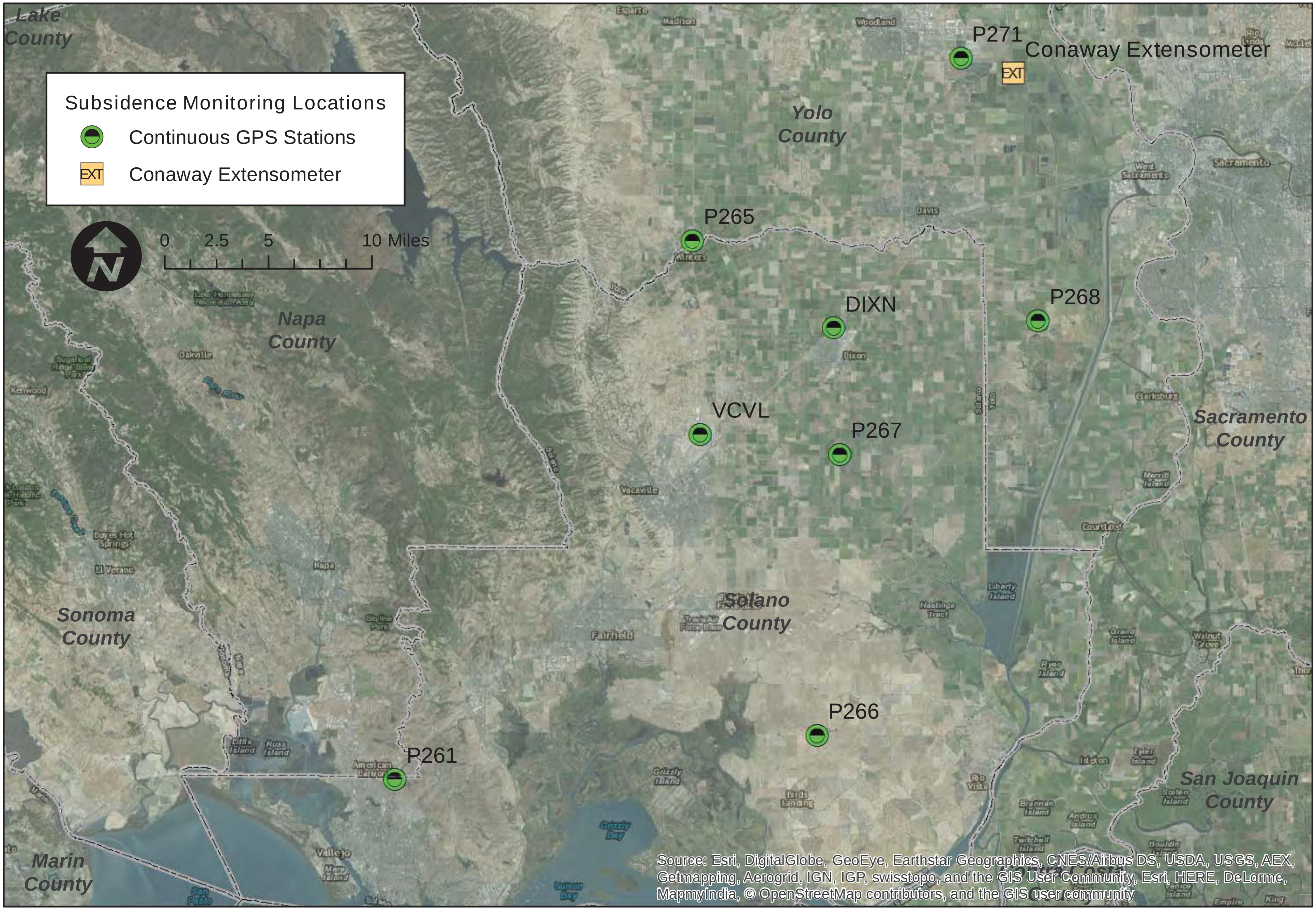


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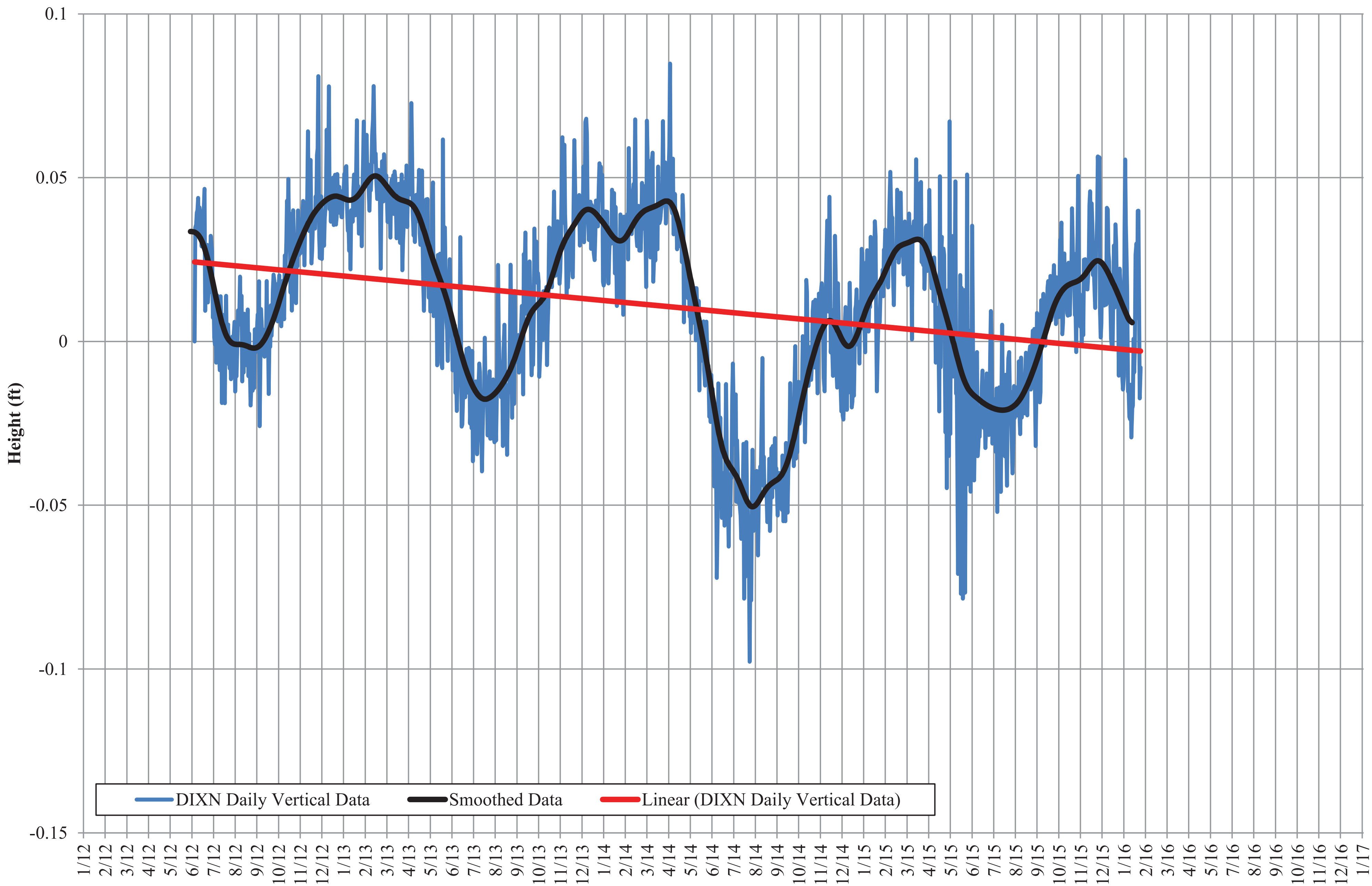
Figure 2-19
Subsidence Monitoring Locations
Solano County and Nearby Yolo County Sites




DIXN; DixonCity_CA2012; 38.4687154840N -121.8286422934E

y = -0.000020136563x + 0.851247742307

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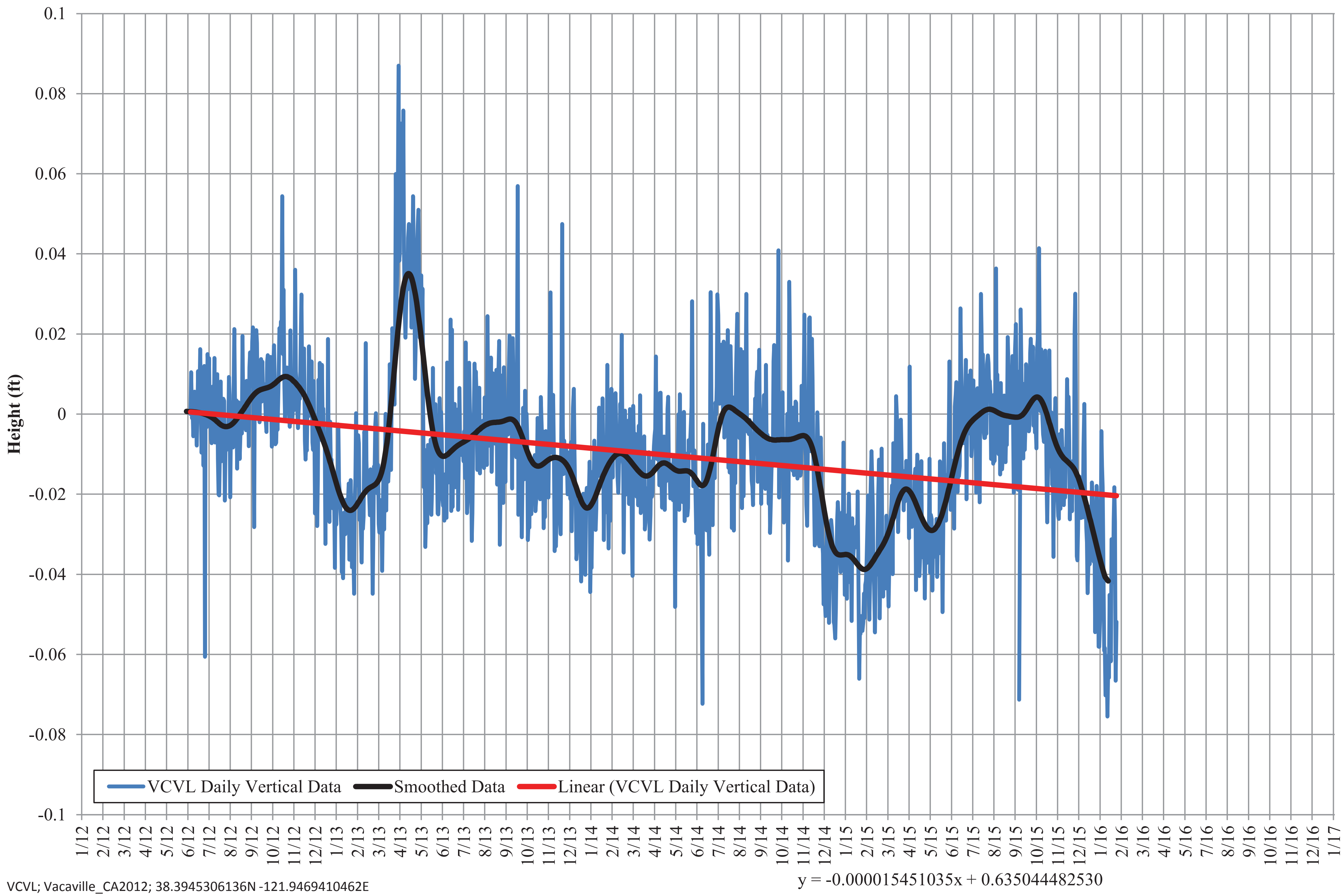
**Figure 2-20**
**SCWA Subsidence Station in Dixon**
**DIXN Station**




VCVL; Vacaville_CA2012; 38.3945306136N -121.9469410462E

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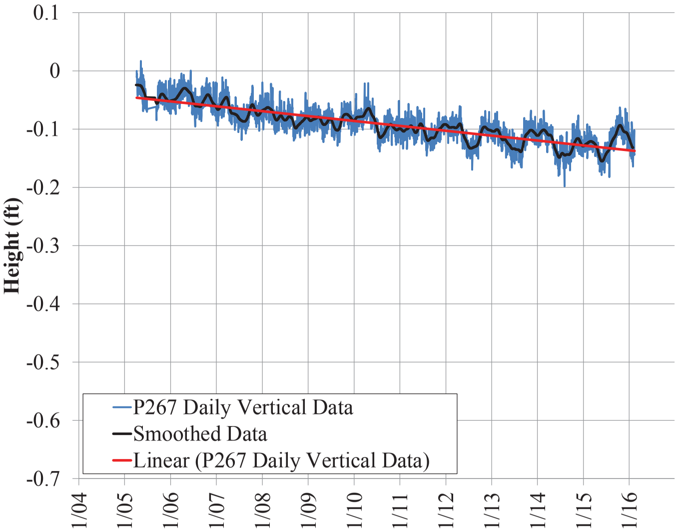
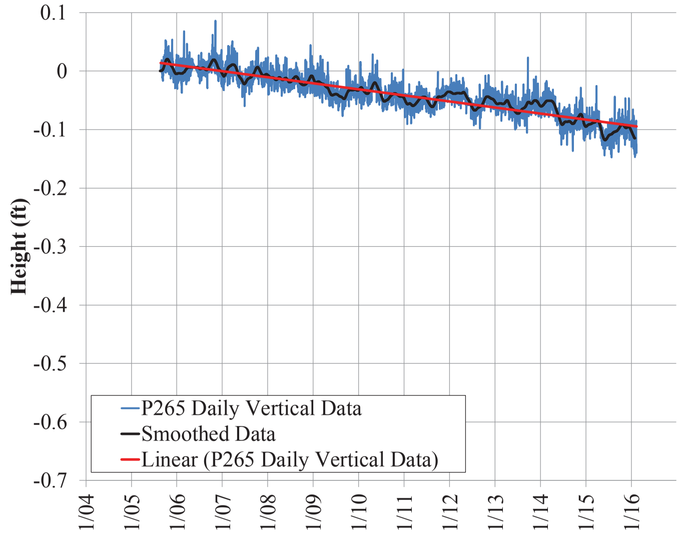
**Figure 2-21**
**SCWA Subsidence Station in Vacaville**
**VCVL Station**



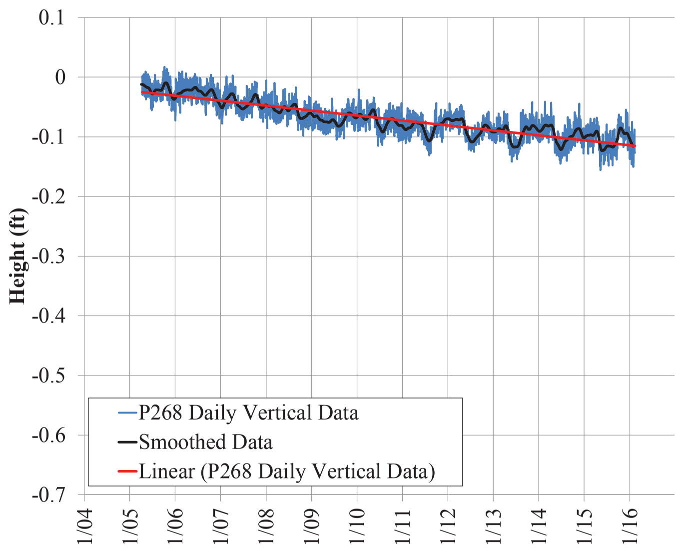

P267; DixonAviatCN2005; 38.3803352398N -121.8232349582E

**Station P267 Near Dixon**



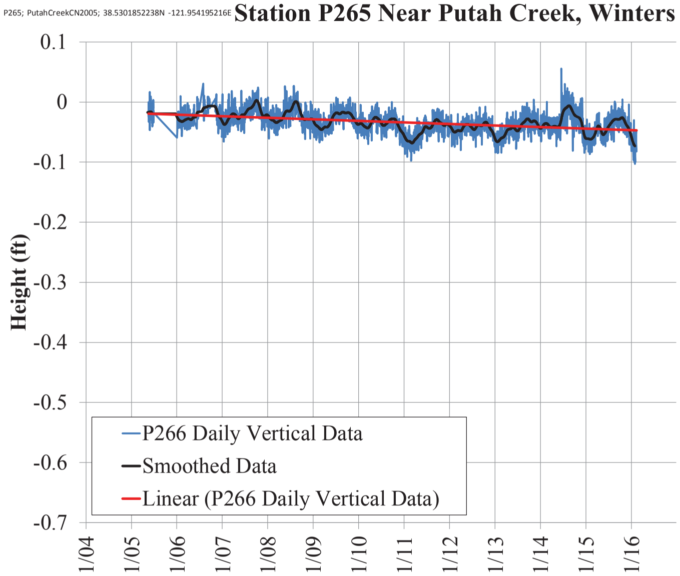

P265; PutahCreekCN2005; 38.5301852238N -121.954195216E

**Station P265 Near Putah Creek, Winters**



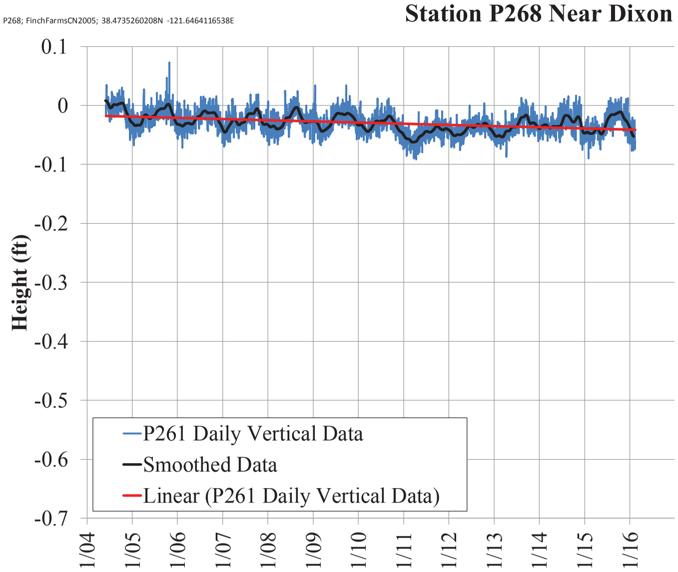

P268; FinchFarmsCN2005; 38.4735260208N -121.6464116538E

**Station P268 Near Dixon**



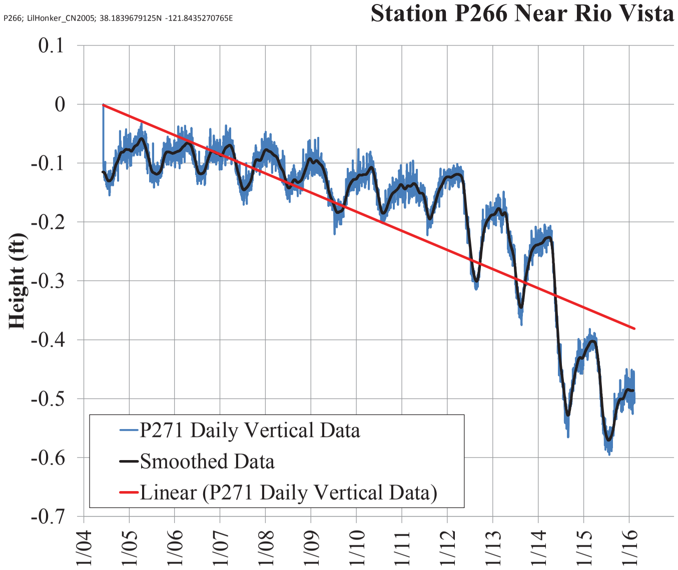

P266; LilHonker_CN2005; 38.1839679125N -121.8435270765E

**Station P266 Near Rio Vista**




P261; HunterHill_CN2004; 38.1529600278N -122.217540082E

**Station P261 Near Vallejo**




P271; Woodland1_CN2004; 38.6573502268N -121.7145501919E

**Station P271 Near Woodland**

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**Figure 2-22**
**Continuous GPS Data from Stations in Solano County and Nearby Yolo County Plate Boundary Observatory UNAVCO**

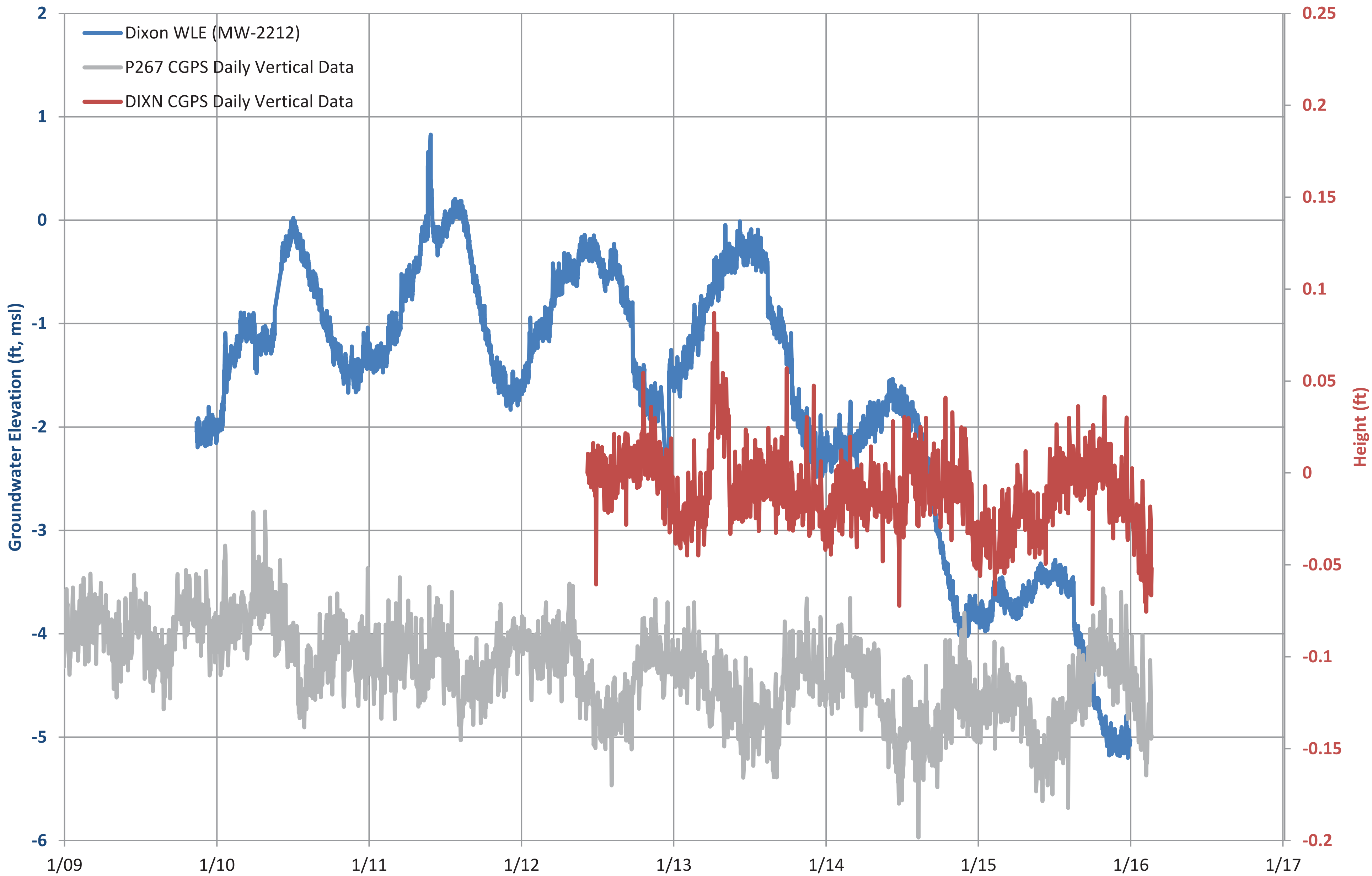


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**Figure 2-23**
**Water Level and Continuous GPS Data**
**SCWA Dixon Site (and P267)**

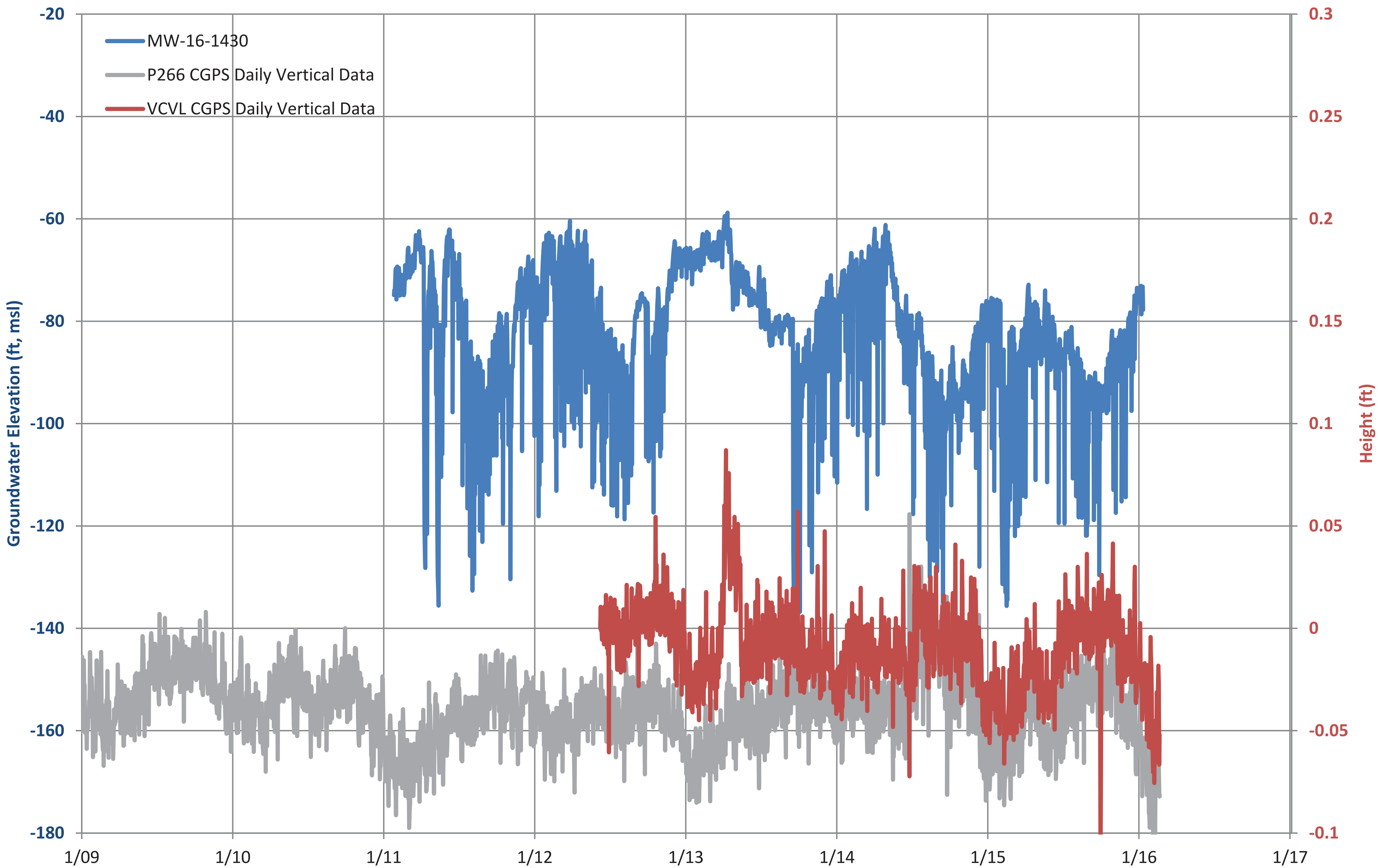


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**Figure 2-24**
**Water Level and Continuous GPS Data**
**SCWA Vacaville Site (and P266)**

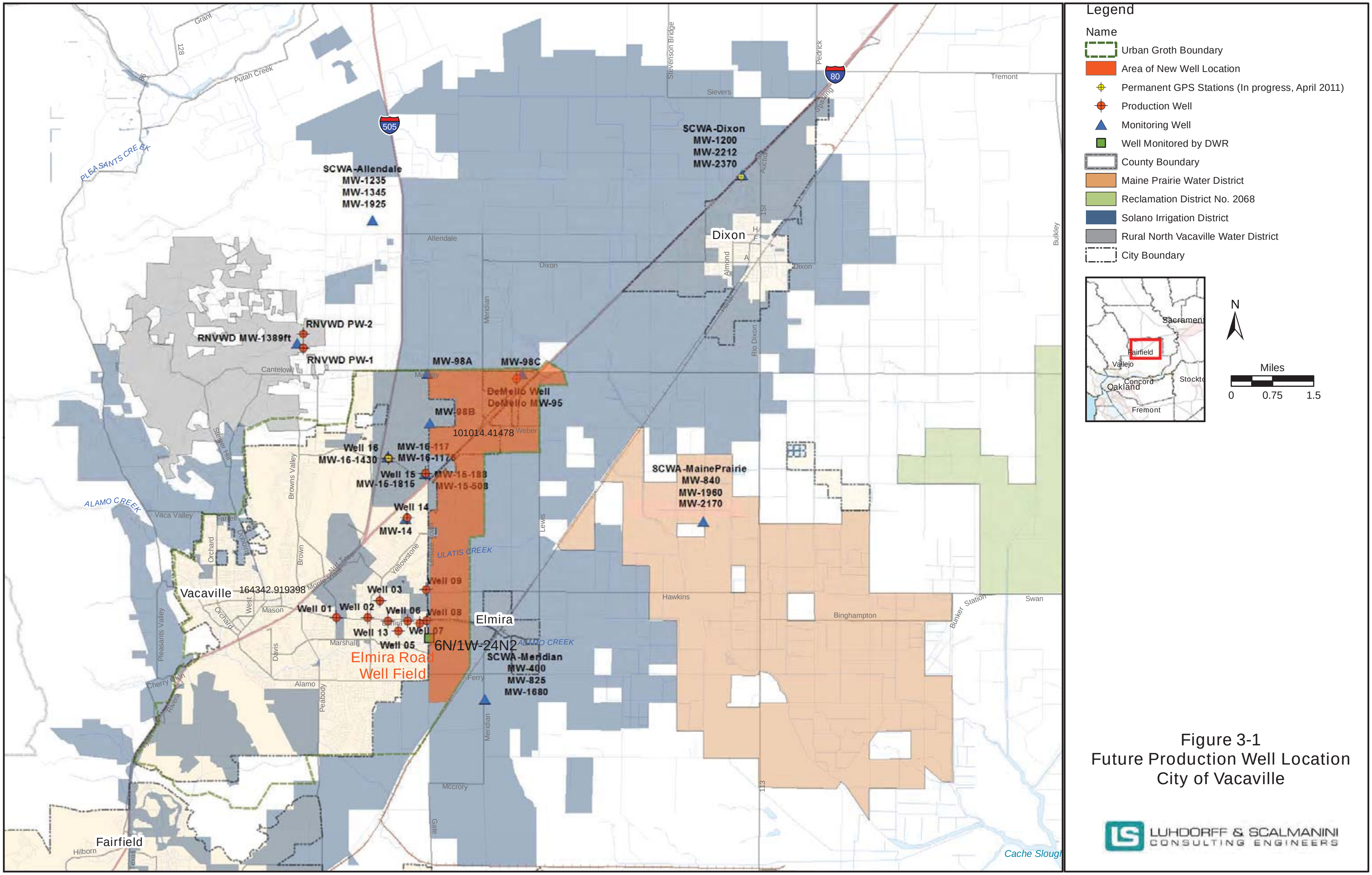


Figure 3-1
Future Production Well Location
City of Vacaville

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# APPENDIX A

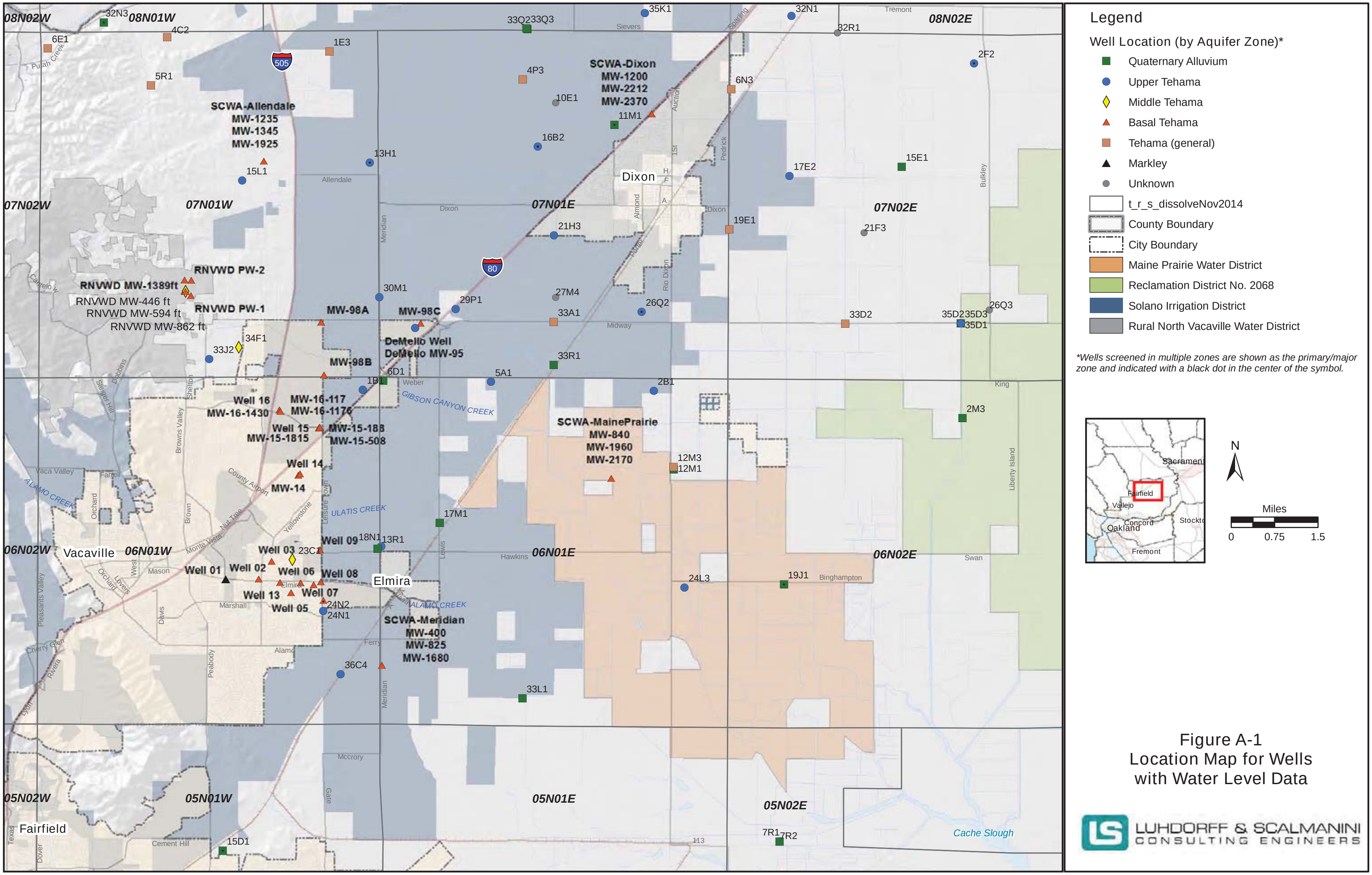


Figure A-1
Location Map for Wells
with Water Level Data

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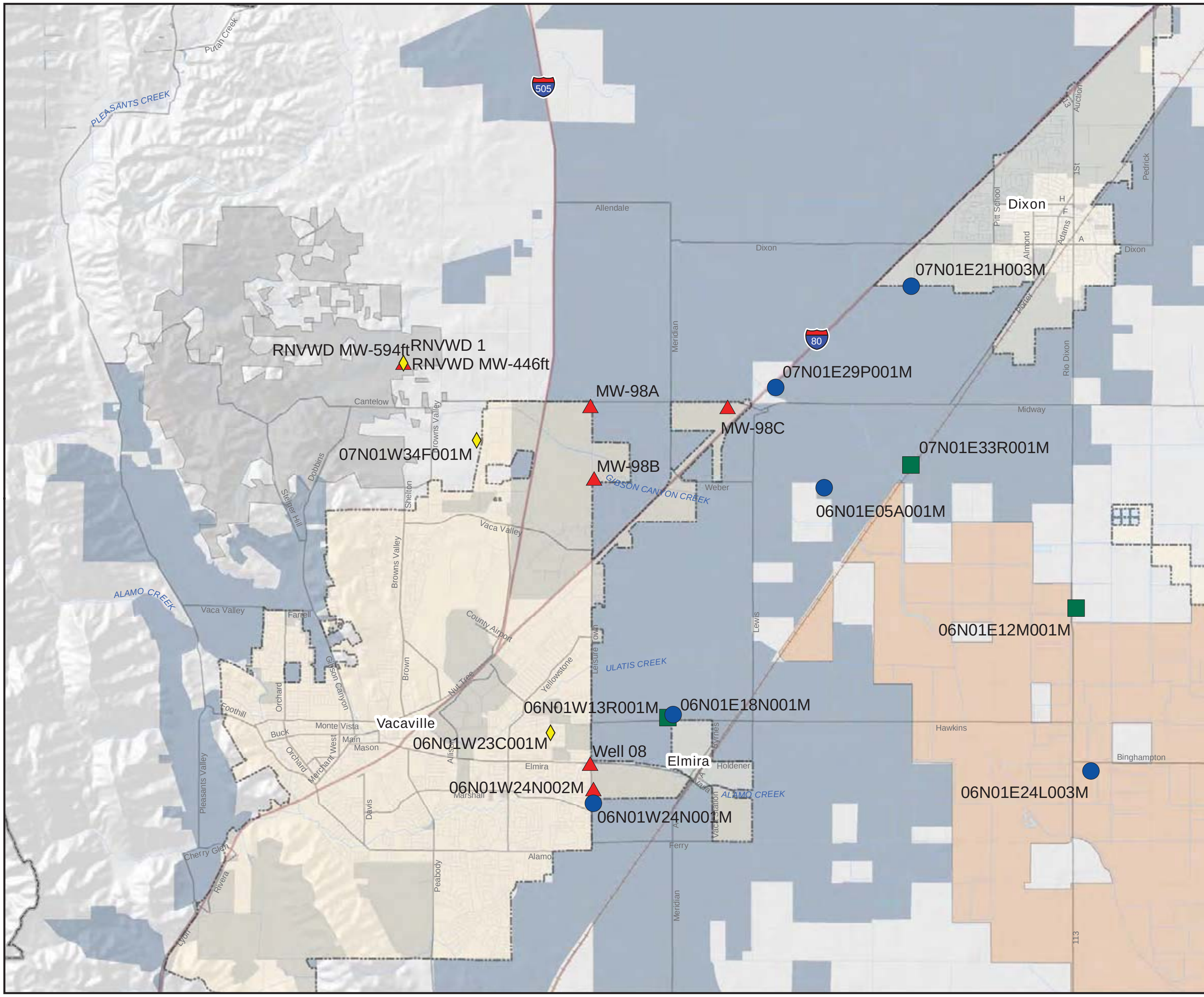


Legend

- Quaternary Alluvium
- Upper Zone of Tehama Formation
- Middle Zone of Tehama Formation
- Basal Zone of Tehama Formation
- City Boundary
- Maine Prairie Water District
- Reclamation District No. 2068
- Solano Irrigation District
- Rural North Vacaville Water District


N

Miles

0 0.75 1.5

Figure A-2
Well Location Map
for Hydrographs on Figure A-3

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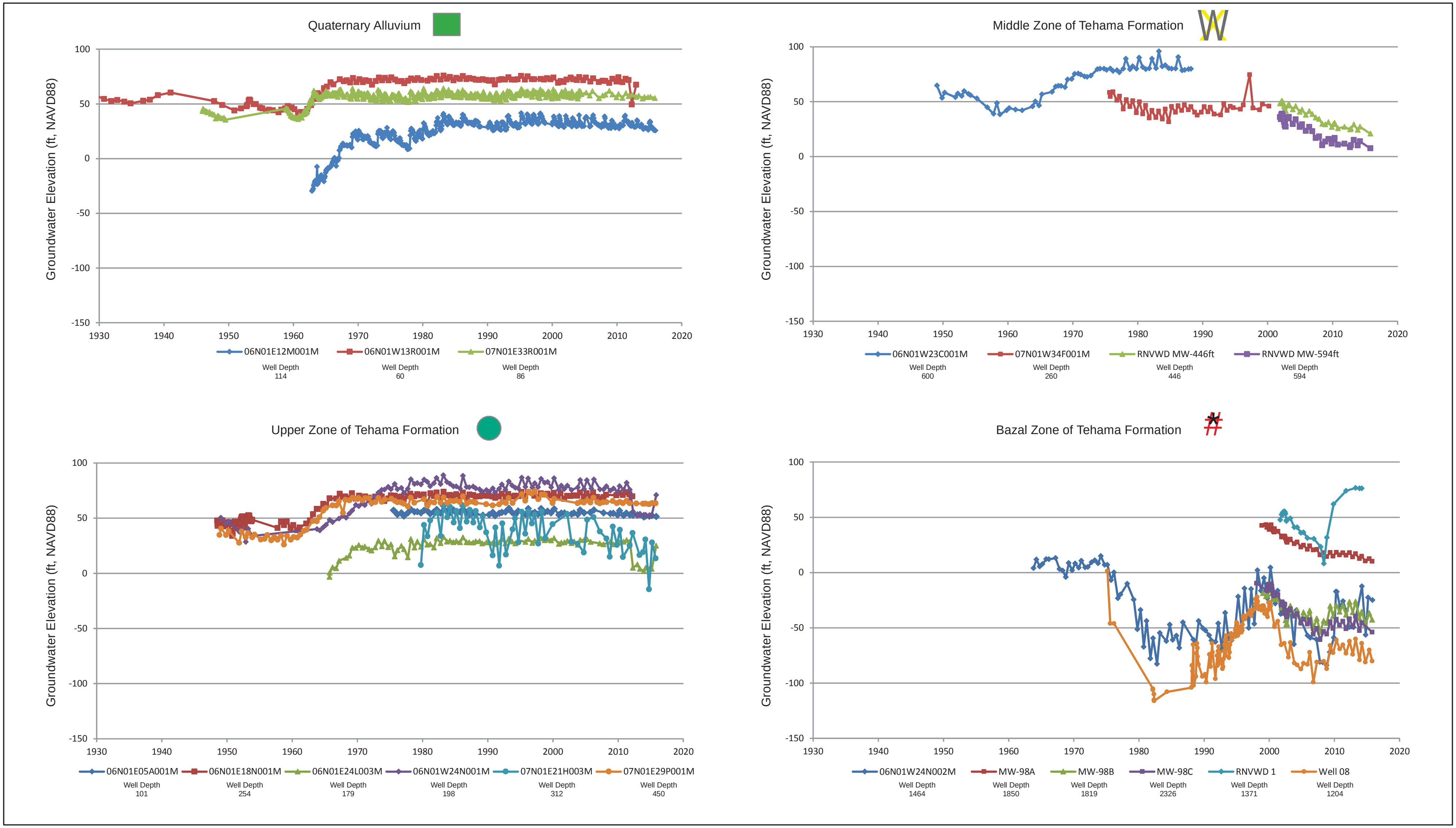


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**Figure A-3**
**Hydrographs of Groundwater Elevations by Zone**

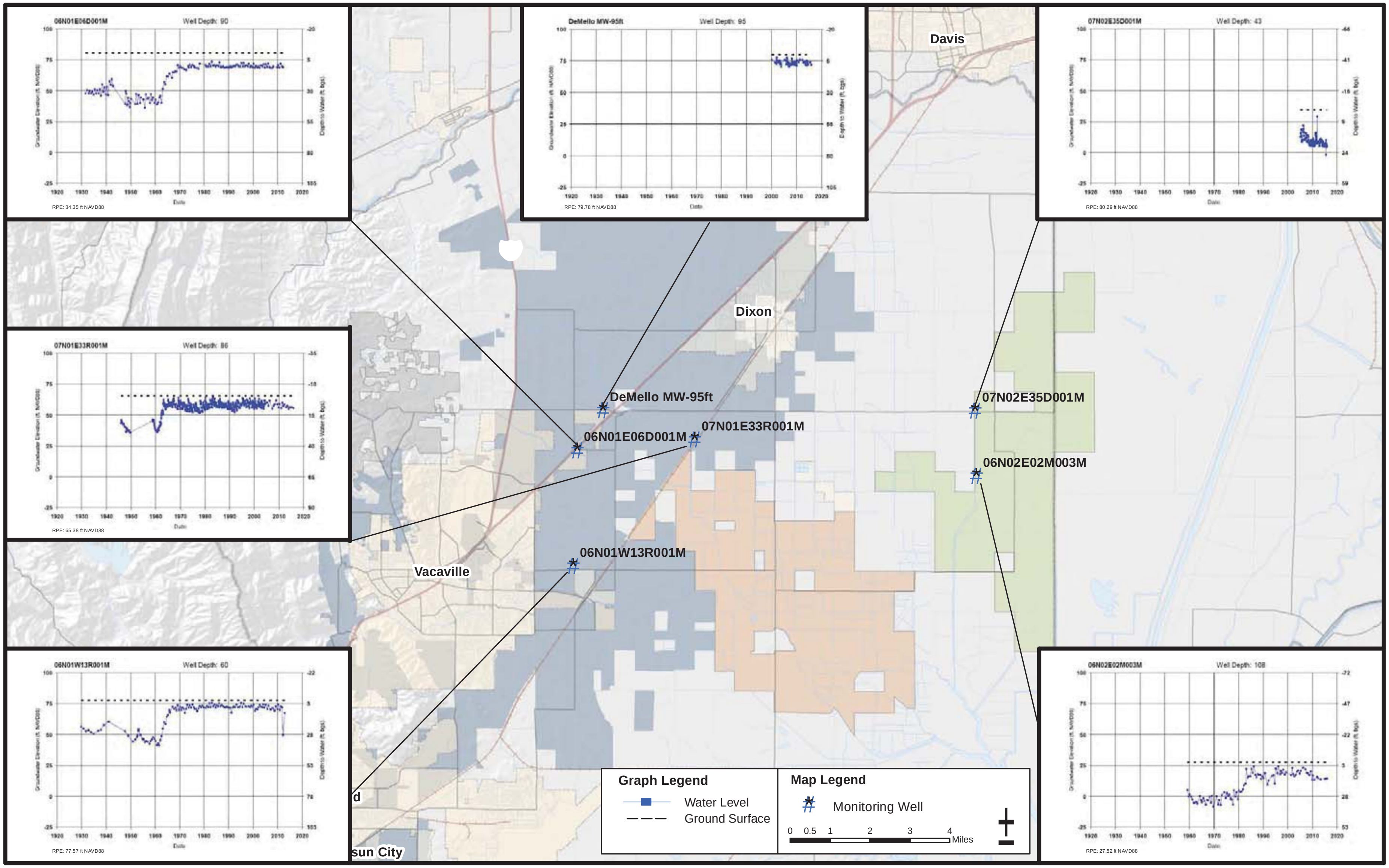


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**Figure A-4**
**Representative Hydrographs of Alluvial Zone Wells**

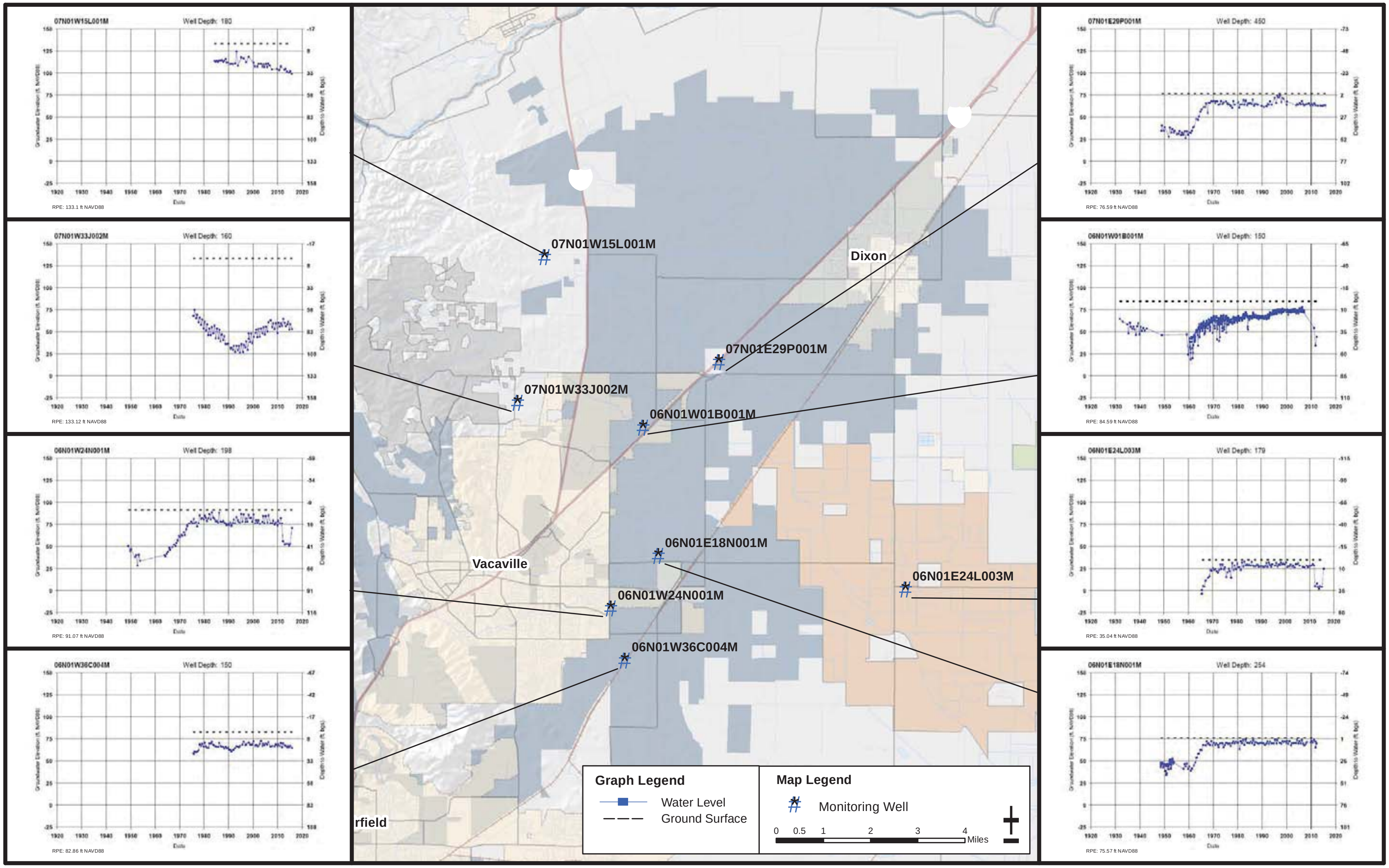


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**Figure A-5**
**Representative Hydrographs of Upper Zone Wells**

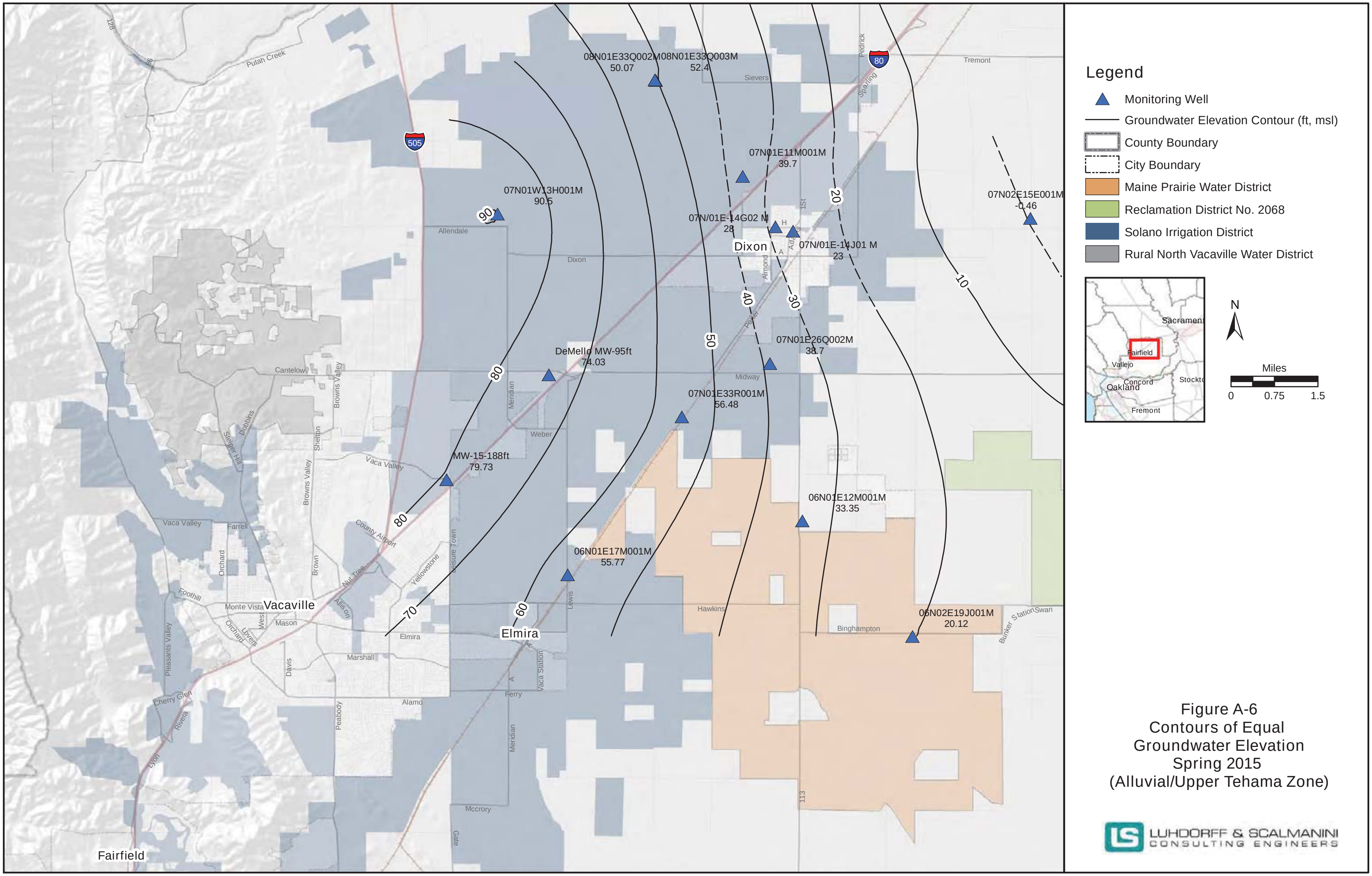


Figure A-6
Contours of Equal
Groundwater Elevation
Spring 2015
(Alluvial/Upper Tehama Zone)

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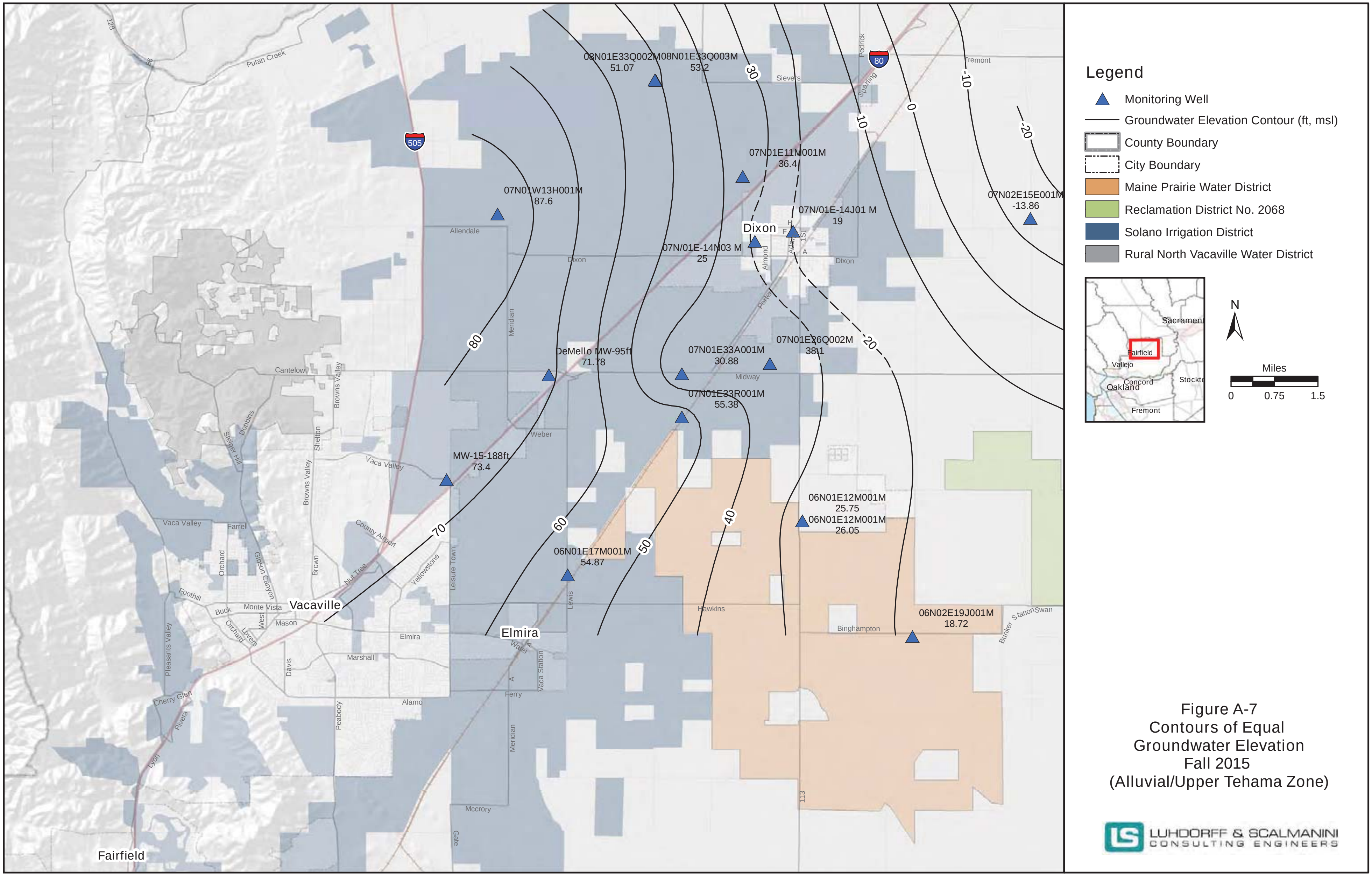


Figure A-7
Contours of Equal
Groundwater Elevation
Fall 2015
(Alluvial/Upper Tehama Zone)

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

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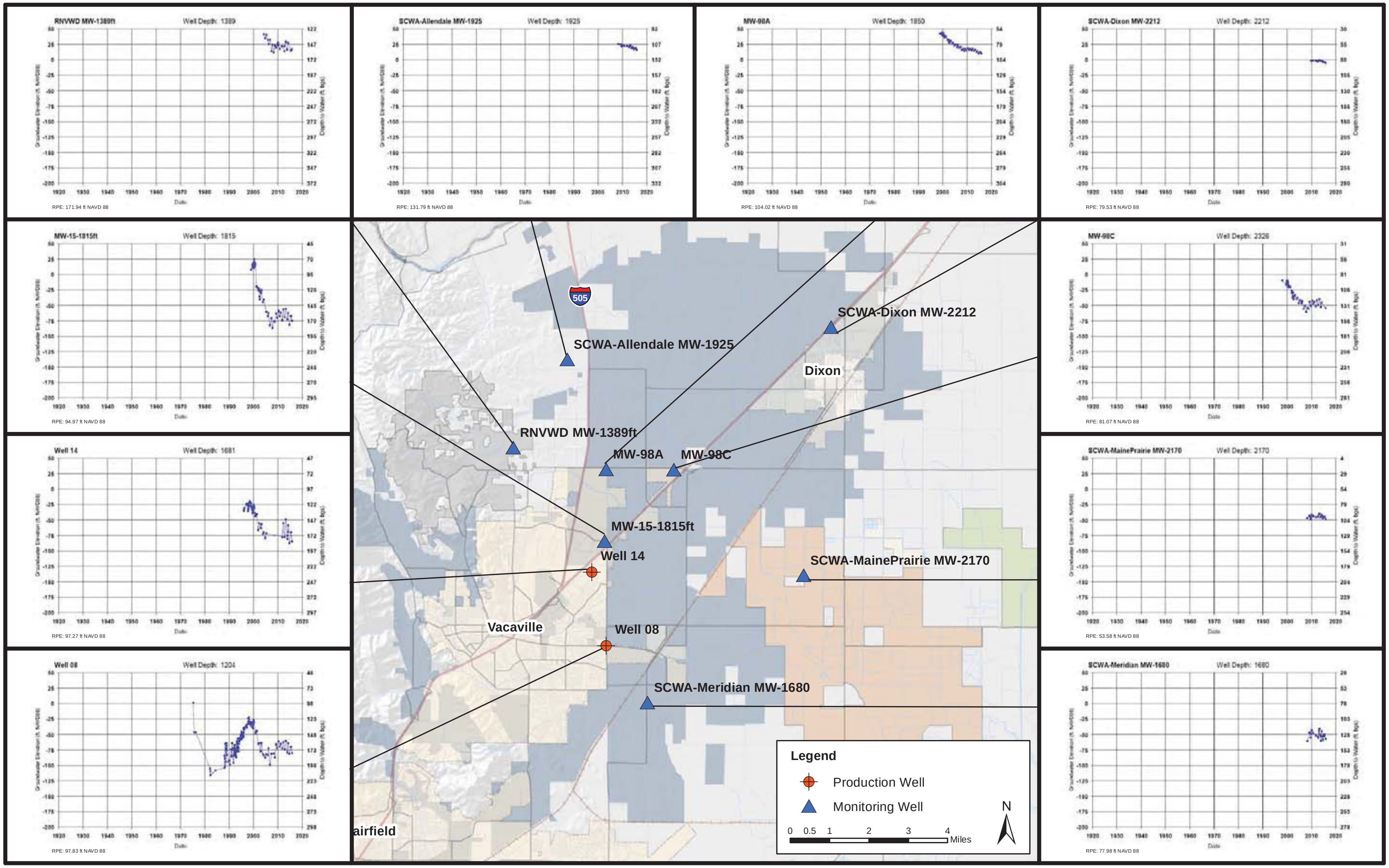


LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

**Figure A-8**
**Representative Hydrographs of Basal Zone Wells**

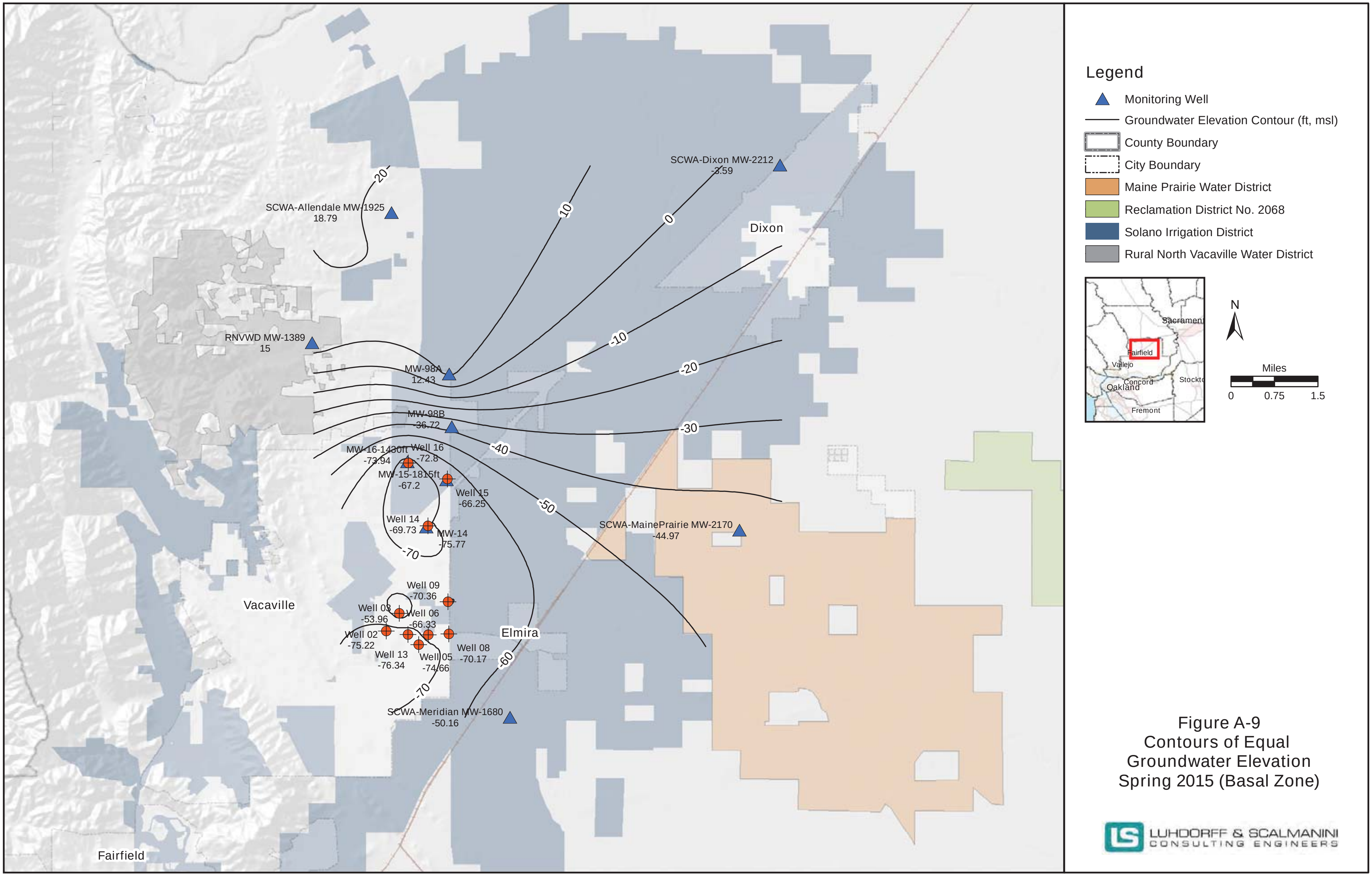


Figure A-9
Contours of Equal
Groundwater Elevation
Spring 2015 (Basal Zone)

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

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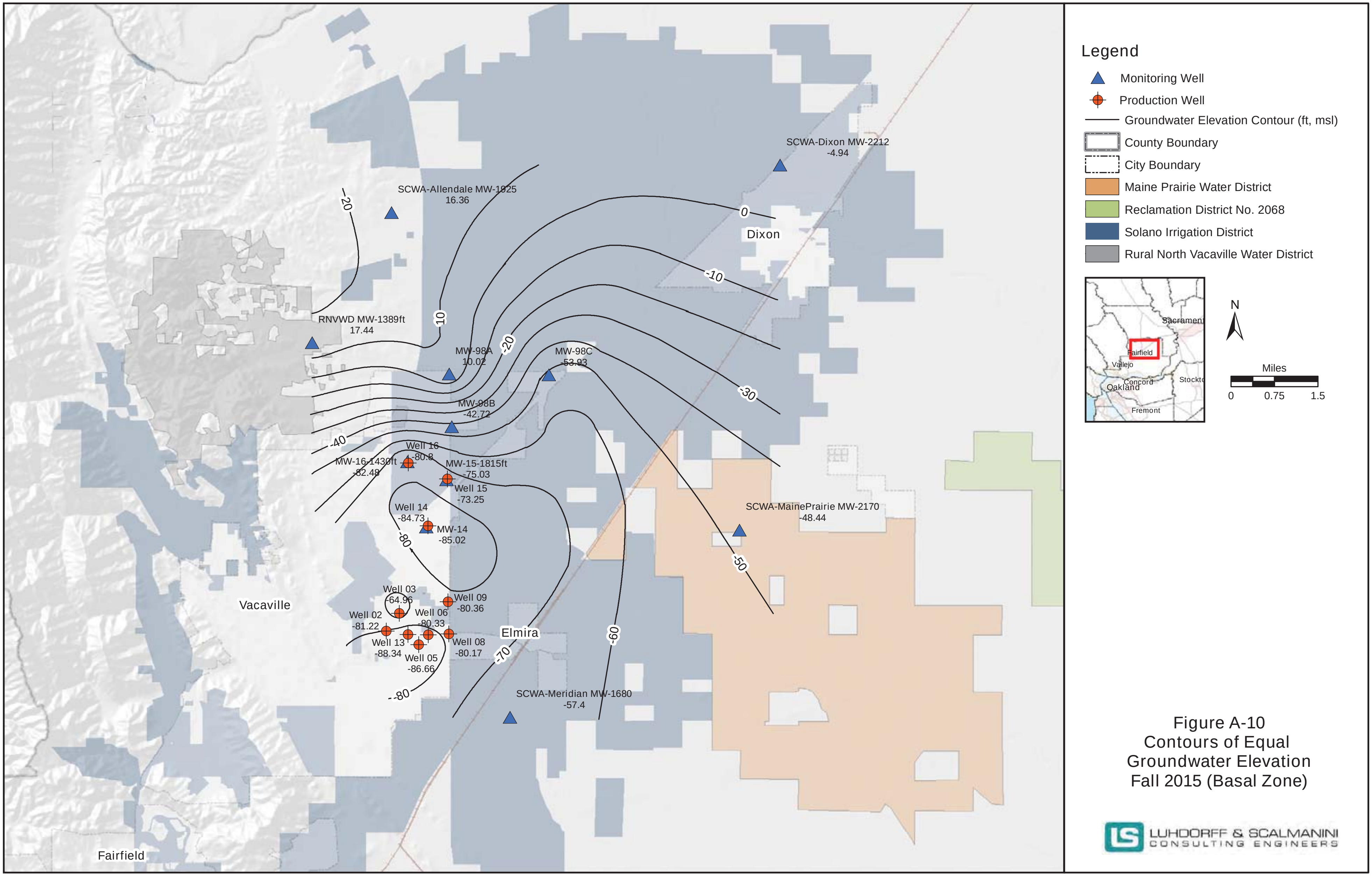


Figure A-10
Contours of Equal
Groundwater Elevation
Fall 2015 (Basal Zone)

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# APPENDIX B

# APPENDIX B Groundwater Flow Model

An analytical groundwater flow model was used to assess water level impacts from future increases in groundwater pumpage by the City of Vacaville to meet future water demands. The modeling effort included simulations of a baseline scenario and ten future pumping scenarios in which pumpage would be increased and/or redistributed within the study area. The ten future scenarios include normal and dry water year pumpage considerations. The well locations for the baseline and future pumping scenarios, including existing wells and four potential new well locations in the north and northeast, are shown in **Figure B-1**. The model results provide a basis for estimating the average annual sustainable pumpage amount that could be used in conjunction with surface water to meet the City's future water demands. The exact location of potential future wells may be different than indicated in Figure B-1. This does not make the results of the analytical model irrelevant. The analytical model is a tool that shows what the water level impacts might be with an increased demand caused by increased groundwater withdrawal. The locations of any new proposed City production wells would have to be carefully considered to ensure that no water quality issues exist, and that potential well interference and water level drawdowns are not an issue. The application of the analytical model presented in this section involved three tasks, including: 1) preparation of the data needed to develop and calibrate the model, 2) model development and calibration, and 3) design and simulation of the future pumping scenarios. The development of the analytical model and the modeling results are summarized below. As a tool, the analytical model could be used to estimate water level drawdowns and potential well interference on any new production well locations proposed by the City.

## B.1 GROUNDWATER FLOW MODEL

An analytical model was used to simulate the incremental increase in drawdown in the northern Solano County area in response to projected City pumpage to the year 2040. The model is based on the Hantush-Jacob (1955) equation as programmed by Walton (1985). The Hantush-Jacob equation calculates drawdown in a confined aquifer that allows for leakage from overlying subsurface materials. Because the Hantush-Jacob model simulates vertical leakage (recharge) to the underlying aquifer, it simulates recovery after pumping periods due to this same mechanism. For purposes of this model application, a no-flow boundary was incorporated to represent the extent of the basal Tehama Formation in the west (**Figure B-1**). The analytical model allows for incorporating well cycling on and off within one day and also seasonal pumping variations.

Input parameters for this analytical model were as follows: transmissivity 40,000 gpd/ft and storativity 0.0002 (from LSCE's 2006 and 2008 reports for the average City of Vacaville basal wells and Well 16's aquifer test in 2007); leakage factor of 20,000 feet (used in previous analytical model efforts by LSCE). The analytical model is not applicable for simulating multiple-year periods because it does not include recharge other than from vertical leakage contributed from overlying zones of the Tehama Formation.

### B.1.1 Model Calibration and Baseline and Future Pumping Scenarios

Calibration and Baseline Scenario

The period from January through December 2006 (2006) was selected as the model calibration period because of the relative frequency of water level measurements, and the availability of data from production and monitoring wells outside of the Elmira Road well field. **Figure B-2** shows a representative calibration hydrograph for Well 8 in the Elmira Road well field. The simulated drawdown and recovery show good correlation to observed water level trends; therefore, the model is considered appropriate for assessing the potential water level impacts of projected pumpage on a year-to-year basis. The model calibration simulation also served as the baseline scenario. The total City pumpage for the baseline scenario was 6,500 AFY for ten wells. Additional pumpage for the Gibson Canyon Area and by RNVWD is also included in the simulation at fixed rates (**Table B-1**). The monthly and annual pumpage amounts for the baseline scenario and the ten future scenarios through 2035 are included in **Attachment A**.

The baseline scenario provides a basis for comparison with the future pumping scenarios. **Figure B-2** shows the 2006 baseline scenario results, including the relationship between the "simulated groundwater elevations" compared to those actually observed in 2006. The simulated groundwater elevations portray the relative simulated month-to-month drawdown pattern in response to pumpage consistent with the 2006 pumpage amount; actual groundwater levels showed a similar overall pattern.

Ten possible future pumping scenarios were developed to evaluate the aquifer response to increased, decreased, and redistributed pumpage in the basal zone, including pumpage at new well locations to the north and northeast (**Figure B-1**). **Table B-1** summarizes the total City pumpage and pumpage by location for each scenario modeled (additional pumpage information is contained in **Attachment A**). As noted on the table, the scenarios also include estimations of other pumpage from the basal zone, including from the RNVWD wells and wells in the Gibson Canyon area. The results of the analytical model are relevant, even if the exact location of future production wells is somewhat different than was estimated in this previous modeling work. As new production wells are sited, the analytical model could be rerun to estimate what the water level drawdowns would be associated with particular new locations.

**Table B-1**
**Summary of Current and Future Basal Tehama Pumping Scenarios**

| Scenario[1] | Elmira Well Field (AFY) | Number of Elmira Wells | Other City Basal Zone (AFY) | Number of Other City Basal Zone Wells | Total City Basal Pumping[2] (AFY) | Total Basal Pumpage[3] (AFY) | Notes[4] |
|---|---|---|---|---|---|---|---|
| Baseline | 4,550 | 7 | 1,950 | 3 | **6,500** | **6,684** | Existing wells with Well 7 out of service |
| Scenario 1 - 2015 | 4,359; 5,231 | 7 | 2,491; 2,340 | 4 | **6,850; 8,220** | **7,034; 8,404** | Add Potential Well (Midway/Eubanks) |
| Scenario 2 - 2020 | 3,736; 4,484 | 6 | 3,114; 3,736 | 5 | **6,850; 8,220** | **7,034; 8,404** | Add Potential Well (Meridian Road/Well 7 abandoned and Replacement) |
| Scenario 3 - 2025 | 3,600; 4,320 | 6 | 3,600; 4,320 | 6 | **7,200; 8,640** | **7,384; 8,824** | Add Potential Well (Willow Drive) |
| Scenario 4 - 20130 | 3,146; 3,775 | 5 | 4,404; 5,285 | 7 | **7,550; 9,060** | **7,734; 9,244** | Add Potential Well (Weber/Byrnes) |
| Scenario 5 - 2035 | 2,909; 3,491 | 4 | 5,091; 6,109 | 7 | **8,000; 9,600** | **8,184; 9,784** | Increase to 8,000 AFY production |

**Notes**

*1. Each scenario includes pumping that represents average precipitation years ("normal" years, shown by the first number listed) and low precipitation years ("dry" years, the second number listed) with the possibility that the City may pump their wells as usual during normal years and may decide to increase their groundwater well pumping during dry years when sufficient surface water supplies are not available. The "dry" year amount is repeated for the Multiple Dry Year simulations.*

*2. When any well is out of service all other available wells will be operated (pumped) to make up for the loss of production. 100 AFY from Well 1 is not included in the simulations, as this well is not completed in the Basal Tehama.*

*3. Other entities known to have wells completed in the Basal Tehama (RNVWD and commercial pumping in the Gibson Canyon Area) add an estimated 184 AFY to the annual pumping in the area simulated.*

*4. Wells in the Elmira Well Field will be removed from service according to the order of the City's well replacement schedule.*

## B 2 MODEL RESULTS AND GROUNDWATER SUPPLY SUFFICIENCY

**Figures B-3 to B-7** illustrate the simulated drawdown for six representative locations in the northern Solano County area for the 2015 and 2035 future pumping scenarios (normal water year). The six locations include City Well 8, City Well 16, the Potential Well (Midway/Eubanks), the Potential Well (Meridian Rd/Well 7 Replacement), Maine Prairie nested deep monitoring wells location, and Dixon nested deep monitoring wells location. Each figure also displays the simulated drawdown for the 2006 baseline scenario so that drawdowns based on current and projected pumpage volumes for 2015 and 2035 can be compared. **Table B-2** summarizes the predicted minimum and maximum drawdown for the ten future pumping scenarios in relation to the minimum and maximum drawdown occurring with the 2006 baseline scenario. The results show that groundwater levels in the Elmira Road well field for all future normal water year scenarios would be generally similar to or higher than the 2006 baseline scenario during both minimum and maximum periods of drawdown. This result was expected because the pumpage simulated for the Elmira Road area was similar to or less than the 2006 pumpage for all future normal water year scenarios. The opposite occurs in the northern portion of Solano County, where future groundwater levels (normal and dry water years) are projected to be significantly lower than 2006 levels. This is due to increased pumpage in this area and redistribution of City pumpage away from the Elmira Road well field to the north/northeast at the four potential well locations.

Comparison of the simulated drawdown for future pumping scenarios to the results of the 2006 baseline scenario provides the basis for developing an estimate of the potentially sustainable annual pumpage. This comparison is particularly of interest for wells located in the Elmira Road well field where, as described above, base year groundwater levels are used to evaluate the response of the aquifer system to future pumpage. The base year groundwater levels provide a basis for measuring the response of the aquifer system that is particularly important during single-dry and multiple-dry year periods when the City, as part of its conjunctive water management plan, increases pumpage above normal year levels. Similarly, these water levels also provide a basis for measuring the response of the aquifer system when the City offsets the increase with reduced pumpage in subsequent years. The model results also provide a basis for the recommended maximum pumpage amount for relatively short-term use, i.e., pumpage that could occur during a single-dry year condition.

Although the analytical model is capable of reasonably predicting drawdown during peak pumping periods, it is limited in its ability to accurately predict recovery at the end of each year. Specifically, the model results show essentially complete recovery for all scenarios. However, the actual amount of vertical leakage into the basal zone is unknown and other forms of recharge are not simulated with the model. A multi-year calibration period would be required before a numerical model (rather than the current analytical model) could be used for multi-year simulations.

### B 2.1 Basal Zone Pumpage Simulations for 2015 and 2035

The model results indicate that, with the present and planned location of groundwater development through 2015, annual total pumpage in an amount of about 6,850 acre-feet by the City (and a total pumpage of 7,034 acre-feet when the City and also other pumpers are included) could be sustained for meeting normal water year demands. As shown in **Table B-1**, this total pumpage is comprised of groundwater extracted primarily from the basal zone, but also includes some pumpage by the City from other zones. At this amount of pumpage, some water level recovery is anticipated to occur in the Elmira Road well field due to the pumpage decrease relative to the baseline scenario (**Table B-2**). Existing Wells 14, 15, and 16 show similar levels to slight drawdown compared to the baseline scenario. The

## Table B-2 Simulated Drawdown Results for the Basal Tehama - Normal Years

| | | Simulated Drawdown Results for the Basal Tehama - Normal Years | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Incremental Difference in Simulated Drawdown Compared to Baseline [1] | | | | | | | | | |
| | | Baseline Scenario: 6,500 AFY | | Scenario 1 - 2015: 6,850 AFY | | Scenario 2 - 2020: 6,850 AFY | | Scenario 3 - 2025: 7,200 AFY | | Scenario 4 - 2030: 7,550 AFY | | Scenario 5 - 2035: 8,000 AFY | |
| | Well Name | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) |
| City of Vacaville Production Wells | Well 01 | 30.5 | 84 | ***-0.3*** | ***-1.4*** | ***-3*** | ***-7.6*** | ***-2.7*** | ***-7.5*** | ***-4.3*** | ***-6.9*** | ***-5.3*** | ***-11*** |
| | Well 02 | 38.7 | 112.2 | ***-0.6*** | ***-2.7*** | ***-2.9*** | ***-9.8*** | ***-3*** | ***-10.8*** | ***-4.5*** | ***-9.5*** | ***-12.4*** | ***-34.7*** |
| | Well 03 | 39.7 | 113.4 | ***-0.7*** | ***-2.7*** | ***-3.7*** | ***-9.7*** | ***-3.8*** | ***-10.5*** | ***-5.3*** | ***-9.1*** | ***-4.5*** | ***-7.3*** |
| | Well 05 | 40 | 111.8 | ***-0.9*** | ***-3*** | ***-4.9*** | ***-13*** | ***-5.1*** | ***-14*** | ***-7.6*** | ***-14.3*** | ***-6.5*** | ***-11.4*** |
| | Well 06 | 39.3 | 107.4 | ***-0.8*** | ***-2.8*** | ***-10.8*** | ***-30.7*** | ***-10.7*** | ***-30.8*** | ***-14.2*** | ***-33*** | ***-13.8*** | ***-32.5*** |
| | Well 07 | 31.9 | 83.2 | ***-0.5*** | ***-1.9*** | ***-4*** | ***-11.6*** | ***-3.9*** | ***-11.5*** | ***-9.2*** | ***-16.2*** | ***-8.7*** | ***-15.5*** |
| | Well 08 | 38.9 | 92.5 | ***-0.9*** | ***-2.3*** | ***-3.5*** | ***-10.5*** | ***-3.6*** | ***-10.9*** | ***-17.1*** | ***-28.4*** | ***-16.5*** | ***-27.5*** |
| | Well 09 | 37.4 | 97.5 | ***-0.6*** | ***-2.1*** | ***-3.7*** | ***-8.1*** | ***-3.5*** | ***-8.2*** | ***-5.6*** | ***-8*** | ***-3.3*** | ***-2.6*** |
| | Well 13 | 40.7 | 116.1 | ***-0.8*** | ***-3.1*** | ***-5.1*** | ***-12*** | ***-5.2*** | ***-13*** | ***-7.3*** | ***-12.5*** | ***-6.7*** | ***-10.8*** |
| | Well 14 | 30.9 | 83.3 | 0.1 | ***-0.5*** | ***-0.4*** | ***-2.7*** | 0.6 | ***-0.9*** | 1.5 | 2.8 | 4.7 | 10.1 |
| | Well 15 | 31.7 | 68.6 | 0.3 | 0.7 | ***-0.6*** | 0.3 | 1.6 | 4.8 | 3.3 | 10 | 7.5 | 17.9 |
| | Well 16 | 28.6 | 72.8 | 1 | 1.5 | 1 | 1.1 | 2.3 | 3.4 | 3.8 | 8.2 | 7.5 | 16.6 |
| | Well 17 (Midway/Eubanks) | 10.7 | 26.8 | 13.9 | 29.5 | 14.1 | 30.1 | 14.5 | 31.2 | 16.1 | 35.3 | 19.5 | 42.5 |
| | Well 18 (Meridian Rd/Well7Replace) | 6.5 | 17.5 | 0.7 | 1.5 | 13.7 | 31.1 | 14.3 | 32.3 | 16.9 | 38.6 | 20.2 | 45.8 |
| | Well 19 (Willow Drive) | 16.6 | 40 | 0.7 | 1.6 | 0.4 | 2.2 | 13.6 | 29.6 | 16 | 36.1 | 20 | 44.4 |
| | Well 20 (Weber/Byrnes) | 10.2 | 25.9 | 0.7 | 1.5 | 1.8 | 4.8 | 3.6 | 8.6 | 17.7 | 38.9 | 21.3 | 46.6 |
| City of Vacaville Monitoring Wells | MW-14 | 26.4 | 68.8 | 0.3 | 0.1 | ***-0.3*** | ***-2.2*** | 0.9 | 0.1 | 1.5 | 3.1 | 4 | 8.1 |
| | MW-15-1815ft | 26.8 | 60 | 0.4 | 1.1 | ***-0.4*** | 0.7 | 1.9 | 5.5 | 3.4 | 10.2 | 6.8 | 16.8 |
| | MW-16-1614ft | 20 | 48.7 | 1.5 | 2.9 | 0.8 | 2.6 | 2.2 | 5.6 | 3.4 | 9.5 | 5.8 | 14.5 |
| | MW-98A | 10 | 25.4 | 2 | 4.1 | 2.5 | 6 | 3.7 | 8.6 | 5.3 | 12.9 | 7 | 16.5 |
| | MW-98B | 14.6 | 35.6 | 1.4 | 3 | 1.4 | 4.1 | 3.6 | 8.7 | 5.4 | 13.6 | 7.6 | 18.2 |
| | MW-98C | 6.9 | 18.4 | 0.7 | 1.6 | 4.7 | 10.9 | 5.6 | 13 | 8 | 18.7 | 9.9 | 22.8 |
| Peripheral Monitoring Wells | Allendale MW-1925 | 3.4 | 10.2 | 1 | 2.2 | 1.3 | 3 | 1.6 | 3.8 | 2.1 | 5.3 | 2.7 | 6.8 |
| | Dixon MW-2212 | 0.7 | 3.2 | 0.1 | 0.4 | 0.4 | 0.8 | 0.5 | 1.1 | 0.7 | 1.7 | 0.8 | 2.2 |
| | Maine Prairie MW-2170 | 3.5 | 10.6 | 0.1 | 0.2 | 0.1 | 0.5 | 0.4 | 1.2 | 0.7 | 2.3 | 1 | 3.3 |
| | Meridian MW-1680 | 14.2 | 36.5 | ***-0.2*** | ***-0.6*** | ***-2.5*** | ***-3.7*** | ***-2.3*** | ***-3.4*** | ***-3.6*** | ***-4*** | ***-3.4*** | ***-3.6*** |
| Other Basal Tehama Pumping Locations | RNVWD 1 | 8.3 | 21.6 | 2.3 | 4.8 | 2.2 | 5.1 | 2.7 | 6.4 | 3.4 | 8.5 | 4.5 | 11 |
| | RNVWD 2 | 7.8 | 20.3 | 2.1 | 4.5 | 2.1 | 4.9 | 2.6 | 6.2 | 3.2 | 8.2 | 4.3 | 10.6 |
| | 11 #3 AHF (Mariani) | 16.7 | 38.8 | 2.5 | 5.3 | 2.2 | 5.5 | 3.3 | 8 | 4.4 | 11.5 | 6.3 | 15.6 |
| | 1 #5 AHF (Mariani) | 16 | 37.2 | 2.7 | 5.7 | 2.5 | 6.1 | 3.6 | 8.6 | 4.8 | 12.1 | 6.7 | 16.2 |

1. Total AFY listed for each scenario represents pumping in the Basal Tehama aquifer unit by the City of Vacaville during a normal year. A negative incremental difference indicates that less drawdown was simulated compared to the baseline scenario.

largest additional drawdown (13.9 to 29.5 feet) occurs at the Potential Well (Midway/Eubanks) location. During dry water years, as would be expected, additional drawdown compared to the baseline drawdown occurs both in and away from the Elmira Road well field (**Table B-3**).

At the amount of pumpage simulated for 2015 (normal water years), groundwater levels in the basal zone are anticipated to remain at or above the 1992-1993 base year and 2002-2003 water levels in the Elmira Road well field. However, the distribution of pumpage in the basal zone is very important. It is recommended that normal-year basal zone pumpage in the Elmira Road well field be limited to not more than occurred during 1992 and 2002 (i.e., about 5,600 acre-feet). The balance of the normal year supply from groundwater sources would result from pumpage elsewhere in the northern to northeastern part of Solano County. In 2015, the total sustainable City pumpage, including groundwater from basal and non-basal zones, is estimated to be about 6,950 acre-feet.

In future years, at year 2035, shifting pumpage to proposed City well locations sited away from the Elmira Road well field would reduce drawdown in the Elmira Road area (**Tables B-2** and **B-3**). Similarly, management of the timing and distribution of pumpage would ensure that water levels in the basal zone remain at or above the 1992-1993 base year and 2002-2003 water levels. Managed pumpage from the basal zone would also allow the level of sustainable pumpage within the northern Solano County area to be increased. However, as other groundwater sources outside the Elmira Road well field are developed, the influence of the basal zone pumpage in other areas on groundwater levels at the Elmira Road well field and elsewhere in northern Solano County must also be considered. For the normal water year 2035 scenario with a pumpage total of 8,184 acre-feet, some water level recovery is anticipated to occur in the Elmira Road well field due to the pumpage decrease relative to the baseline scenario (**Table B-2**). Existing Wells 14, 15, and 16 show increased levels of drawdown compared to the 2015 scenario. The largest additional drawdown (more than 40 feet maximum drawdown difference) compared to the baseline scenario occurs at the four potential new well locations. During dry water years, as would be expected, additional drawdown compared to the baseline drawdown occurs both in and away from the Elmira Road well field (**Table B-3**).

Minimum and maximum simulated drawdowns were also evaluated at locations farther from the City's pumping. Particularly, **Tables B-2** and **B-3** summarize drawdown compared to the baseline scenario for locations at four SCWA monitoring well sites (Allendale MW-1925; Dixon MW-2212; Maine Prairie MW-2170; and Meridian MW-1680). Comparative drawdown amounts are also illustrated for two of these locations (Dixon and Maine Prairie) on **Figure B-3** for the 2015 (normal water year) and 2035 (normal and dry water years) scenarios. As shown in **Tables B-2** and **B-3** and **Figure B-3**, little drawdown occurs at these locations (up to 3.3 feet maximum simulated drawdown at the Maine Prairie location for a normal water year simulation in 2035).Slightly more drawdown (up to 6 feet maximum drawdown at Maine Prairie) is simulated at these locations for the 2035 (dry year) scenario (**Table B-3**).

The results for the normal water year 2035 scenario indicate the overall lowering of hydraulic heads in the northern to northeastern Solano County area and a shift in the position of the cone of depression. Levels are also likely to decrease below historical levels, especially in areas where there has been little to no prior development of groundwater supplies from the basal Tehama Formation. Groundwater levels are anticipated to reach a new equilibrium between extraction and recharge. However, at some stage of total groundwater level development from this deep unit, levels may continue to decline reflecting a net deficit in the overall groundwater budget.

## Table B-3 Simulated Drawdown Results for the Basal Tehama - Dry Years

| | | Simulated Drawdown Results for the Basal Tehama - Dry Years | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Incremental Difference in Simulated Drawdown Compared to Baseline [1] | | | | | | | | | |
| | | Baseline Scenario: 6,500 AFY | | Scenario 1 - 2015: 8,220 AFY | | Scenario 2 - 2020: 8,220 AFY | | Scenario 3 - 2025: 8,640 AFY | | Scenario 4 - 2030: 9,060 AFY | | Scenario 5 - 2035: 9,600 AFY | |
| | Well Name | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) | Minimum Simulated Drawdown (ft) | Maximum Simulated Drawdown (ft) |
| City of Vacaville Production Wells | Well 01 | 30.5 | 84 | 5.7 | 15 | 2.5 | 7.6 | 2.7 | 7.7 | 0.9 | 8.4 | ***-0.3*** | 3.4 |
| | Well 02 | 38.7 | 112.2 | 6.9 | 19.1 | 4.2 | 10.5 | 4.1 | 9.4 | 2.3 | 10.9 | ***-7.1*** | ***-19.3*** |
| | Well 03 | 39.7 | 113.4 | 7.1 | 19.3 | 3.4 | 10.9 | 3.4 | 10 | 1.5 | 11.6 | 2.5 | 13.8 |
| | Well 05 | 40 | 111.8 | 6.9 | 18.7 | 2.1 | 6.7 | 1.9 | 5.5 | ***-1.3*** | 5.1 | 0.2 | 8.6 |
| | Well 06 | 39.3 | 107.4 | 6.8 | 18 | ***-5.1*** | ***-15.4*** | ***-5*** | ***-15.5*** | ***-9.3*** | ***-18.2*** | ***-8.8*** | ***-17.6*** |
| | Well 07 | 31.9 | 83.2 | 5.7 | 14.3 | 1.5 | 2.7 | 1.7 | 2.7 | ***-4.8*** | ***-2.9*** | ***-4.1*** | ***-2.1*** |
| | Well 08 | 38.9 | 92.5 | 6.7 | 15.7 | 3.5 | 5.8 | 3.4 | 5.4 | ***-12.8*** | ***-15.7*** | ***-12.1*** | ***-14.6*** |
| | Well 09 | 37.4 | 97.5 | 6.7 | 16.9 | 3 | 9.7 | 3.2 | 9.5 | 0.7 | 9.7 | 3.5 | 16.3 |
| | Well 13 | 40.7 | 116.1 | 7.1 | 19.5 | 2.1 | 8.8 | 1.9 | 7.5 | ***-0.7*** | 8.2 | 0.1 | 10.1 |
| | Well 14 | 30.9 | 83.3 | 6.2 | 15.9 | 5.6 | 13.3 | 6.8 | 15.4 | 7.8 | 19.8 | 11.6 | 28.6 |
| | Well 15 | 31.7 | 68.6 | 6.5 | 14.3 | 5.6 | 13.8 | 8.1 | 19.3 | 10.2 | 25.4 | 15.2 | 35 |
| | Well 16 | 28.6 | 72.8 | 6.7 | 16.1 | 6.8 | 15.6 | 8.2 | 18.4 | 10.2 | 24.1 | 14.6 | 34.1 |
| | Well 17 (Midway/Eubanks) | 10.7 | 26.8 | 18.6 | 40.5 | 18.8 | 41.2 | 19.3 | 42.5 | 21.2 | 47.5 | 25.2 | 56 |
| | Well 18 (Meridian Rd/Well7Replace) | 6.5 | 17.5 | 2.1 | 5.1 | 17.8 | 40.7 | 18.4 | 42.2 | 21.6 | 49.8 | 25.4 | 58.3 |
| | Well 19 (Willow Drive) | 16.6 | 40 | 4 | 9.7 | 3.7 | 10.4 | 19.5 | 43.4 | 22.4 | 51.1 | 27.2 | 61.1 |
| | Well 20 (Weber/Byrnes) | 10.2 | 25.9 | 2.8 | 6.9 | 4.1 | 10.8 | 6.3 | 15.4 | 23.2 | 51.8 | 27.5 | 61 |
| City of Vacaville Monitoring Wells | MW-14 | 26.4 | 68.8 | 5.5 | 13.7 | 4.8 | 11 | 6.2 | 13.7 | 7 | 17.2 | 9.9 | 23.3 |
| | MW-15-1815ft | 26.8 | 60 | 5.8 | 13.1 | 4.8 | 12.6 | 7.5 | 18.4 | 9.3 | 24 | 13.4 | 32 |
| | MW-16-1614ft | 20 | 48.7 | 5.6 | 12.9 | 4.8 | 12.6 | 6.5 | 16.2 | 7.8 | 20.8 | 10.7 | 26.8 |
| | MW-98A | 10 | 25.4 | 4.2 | 9.8 | 4.8 | 12 | 6.3 | 15.2 | 8.2 | 20.3 | 10.3 | 24.7 |
| | MW-98B | 14.6 | 35.6 | 4.4 | 10.5 | 4.5 | 11.8 | 7.1 | 17.3 | 9.2 | 23.2 | 11.8 | 28.7 |
| | MW-98C | 6.9 | 18.4 | 2.2 | 5.5 | 6.9 | 16.7 | 8.1 | 19.2 | 10.9 | 26.1 | 13.1 | 30.9 |
| Peripheral Monitoring Wells | Allendale MW-1925 | 3.4 | 10.2 | 1.8 | 4.5 | 2.1 | 5.5 | 2.5 | 6.5 | 3.1 | 8.3 | 3.9 | 10 |
| | Dixon MW-2212 | 0.7 | 3.2 | 0.3 | 1 | 0.6 | 1.6 | 0.7 | 2 | 0.9 | 2.7 | 1.1 | 3.3 |
| | Maine Prairie MW-2170 | 3.5 | 10.6 | 0.8 | 2.3 | 0.8 | 2.7 | 1.2 | 3.6 | 1.5 | 4.9 | 1.9 | 6 |
| | Meridian MW-1680 | 14.2 | 36.5 | 2.6 | 6.6 | ***-0.1*** | 2.8 | 0.1 | 3.2 | ***-1.6*** | 2.5 | ***-1.3*** | 3 |
| Other Basal Tehama Pumping Locations | RNVWD 1 | 8.3 | 21.6 | 4.1 | 9.6 | 4 | 10 | 4.7 | 11.6 | 5.5 | 14.1 | 6.8 | 17.1 |
| | RNVWD 2 | 7.8 | 20.3 | 3.8 | 9.1 | 3.8 | 9.6 | 4.4 | 11 | 5.2 | 13.5 | 6.5 | 16.4 |
| | 11 #3 AHF (Mariani) | 16.7 | 38.8 | 5.7 | 13.3 | 5.3 | 13.5 | 6.7 | 16.5 | 8 | 20.7 | 10.3 | 25.6 |
| | 1 #5 AHF (Mariani) | 16 | 37.2 | 5.9 | 13.5 | 5.6 | 13.9 | 7 | 16.9 | 8.3 | 21.1 | 10.6 | 26 |

1. Total AFY listed for each scenario represents pumping in the Basal Tehama aquifer unit by the City of Vacaville during a normal year. A negative incremental difference indicates that less drawdown was simulated compared to the baseline scenario.

The modeled basal zone pumpage of 8,184 acre-feet for the 2035 normal year scenario and 9,784 acre-feet for the 2035 dry-year scenario include pumpage in the Elmira Road well field at a lesser amount than occurred during 1992, 2002, and also the 2006 baseline scenario. Based on the model results for the 2035 normal year scenario, City pumpage for future normal years appears to be sustainable at about 8,000 acre-feet for all pumpage from the basal zone. As discussed below, ongoing groundwater monitoring and use of a numerical flow model to refine the estimated sustainable pumpage are recommended.

It is suggested that the 2035 dry year total pumpage for the City of 9,600 acre-feet (as shown in **Table B-1**) be considered only in the context of short-term use as part of a conjunctive water management program. Until additional monitoring data are gathered outside of the Elmira Road area and water level responses to expanded groundwater development and recharge mechanisms are better understood, it is recommended that higher pumpage levels (e.g., dry-year amount) be offset through continued conjunctive water management by reducing pumpage in wet years and allowing water levels to recover.

## B 3 ONGOING GROUNDWATER MONITORING AND FUTURE SUSTAINABLE PUMPAGE ESTIMATE

Planning for additional groundwater development has preliminarily involved the use of an analytical groundwater flow model. Monitoring data have been and will continue to be utilized to assess the actual response to pumping (particularly within the basal zone) so that operations can be adjusted as necessary, i.e., to avoid progressive groundwater level declines.

As part of the conjunctive management of surface water and groundwater to meet the City's requirements, it is recognized that there will be variations in the amount of available surface water supplies from year to year, particularly since a large fraction of the supply is imported from outside the subbasin. Similarly, there are expected to be variations in groundwater conditions as a function of the local hydrogeology that affect, among other things, the natural recharge to the groundwater basin from year to year. Local hydrology, which affects local groundwater conditions in the basal zone, may be considerably different from the hydrology in a distant (Central Sierra Nevada) location that directly affects the availability of imported surface water in any given year.

Recharge to the basal zone is expected to occur primarily east of the English Hills and north of the Vacaville area where the Tehama Formation outcrops. A significant portion of the recharge is probably the result of leakage from the overlying Quaternary alluvium and the upper zone of the Tehama Formation in the outcrop areas. Thus, conjunctive water management by the City necessitates particular attention to groundwater level recovery from year to year to ensure that water levels in the basal zone are maintained to meet a regular component of the City's water supply in normal and wet years and a larger component of the water supply during dry periods that affect supplemental surface water availability.

### B 3.1 Future Refinement of Sustainable Pumpage Estimate

Ongoing evaluation of sustainable pumpage, particularly for the basal zone of the Tehama Formation, will be required to accomplish the main objectives of operating within the yield of the groundwater basin and avoiding overdraft.

Further understanding and quantification of sustainable pumpage from the Tehama Formation (especially the basal zone), which accounts for variations in hydrologic conditions and the location and amount of pumpage, is recommended so that groundwater development and use can be managed in such a way to meet an appropriate fraction of total water demand while avoiding over pumping that could result in overdraft conditions.

The City's historical operating experience, complemented by observed groundwater conditions, has served as the initial basis for determining available groundwater supplies. However, it is possible to refine the analysis to determine values or ranges of yield under varying hydrologic conditions, and to assess the impacts of various management actions that might be implemented in the basin. Development of a numerical groundwater flow model is recommended to determine the yield of the subbasin under existing land use and groundwater and surface water development conditions. Such a model could also be used to assess the yield of the subbasin under future land use conditions as well as future ranges of surface water importation, groundwater development, and recycled water use through varying hydrologic conditions, i.e., wet and dry periods that affect the availability of imported surface water. Among the modeling scenarios examined with a numerical model would be simulation of the effects of redistributing pumpage between the Elmira and northern Solano County areas to reduce the degree to which drawdown in the basal zone occurs at either location.

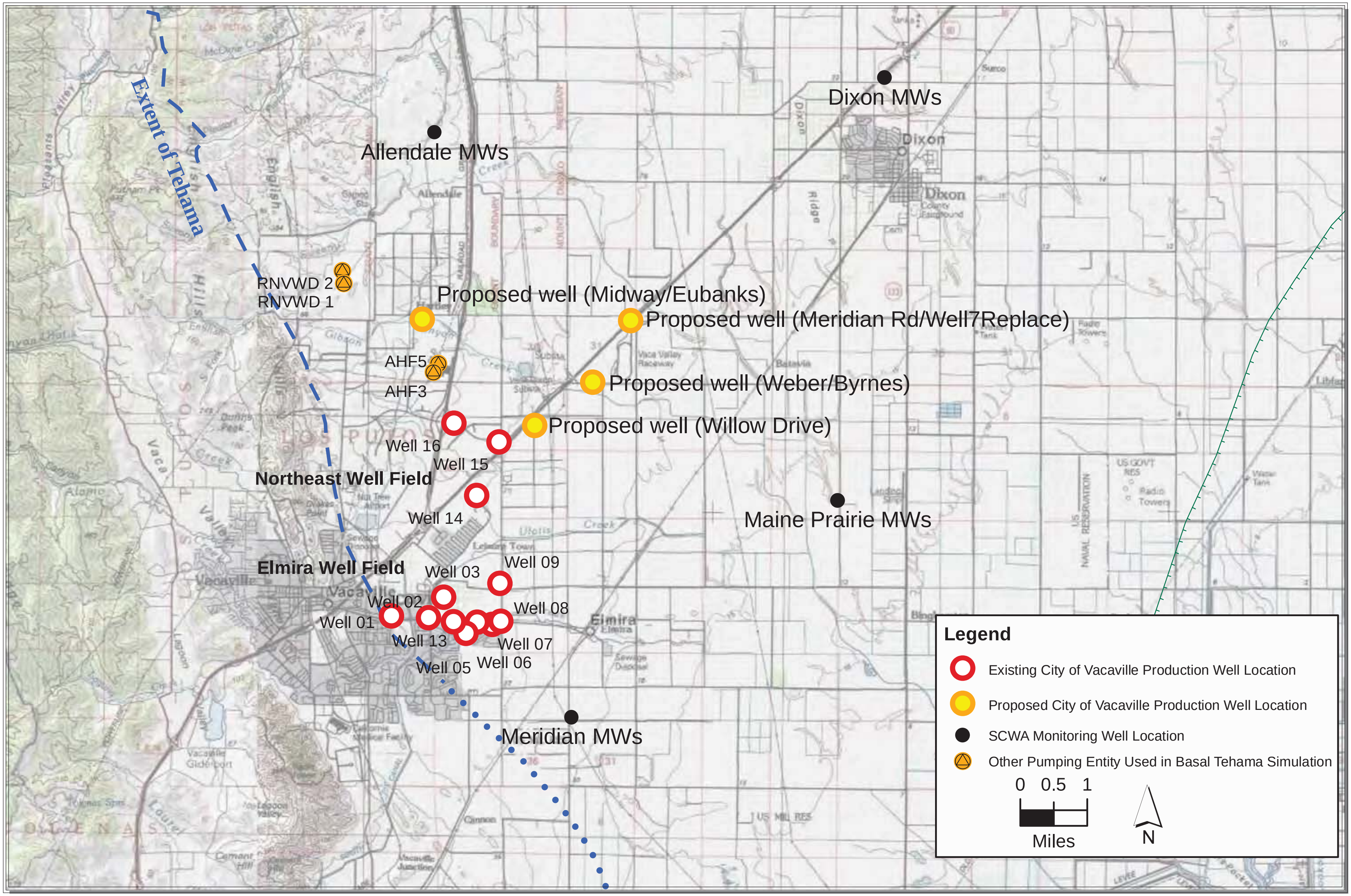


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**Figure B-1**
**Well Location Map**

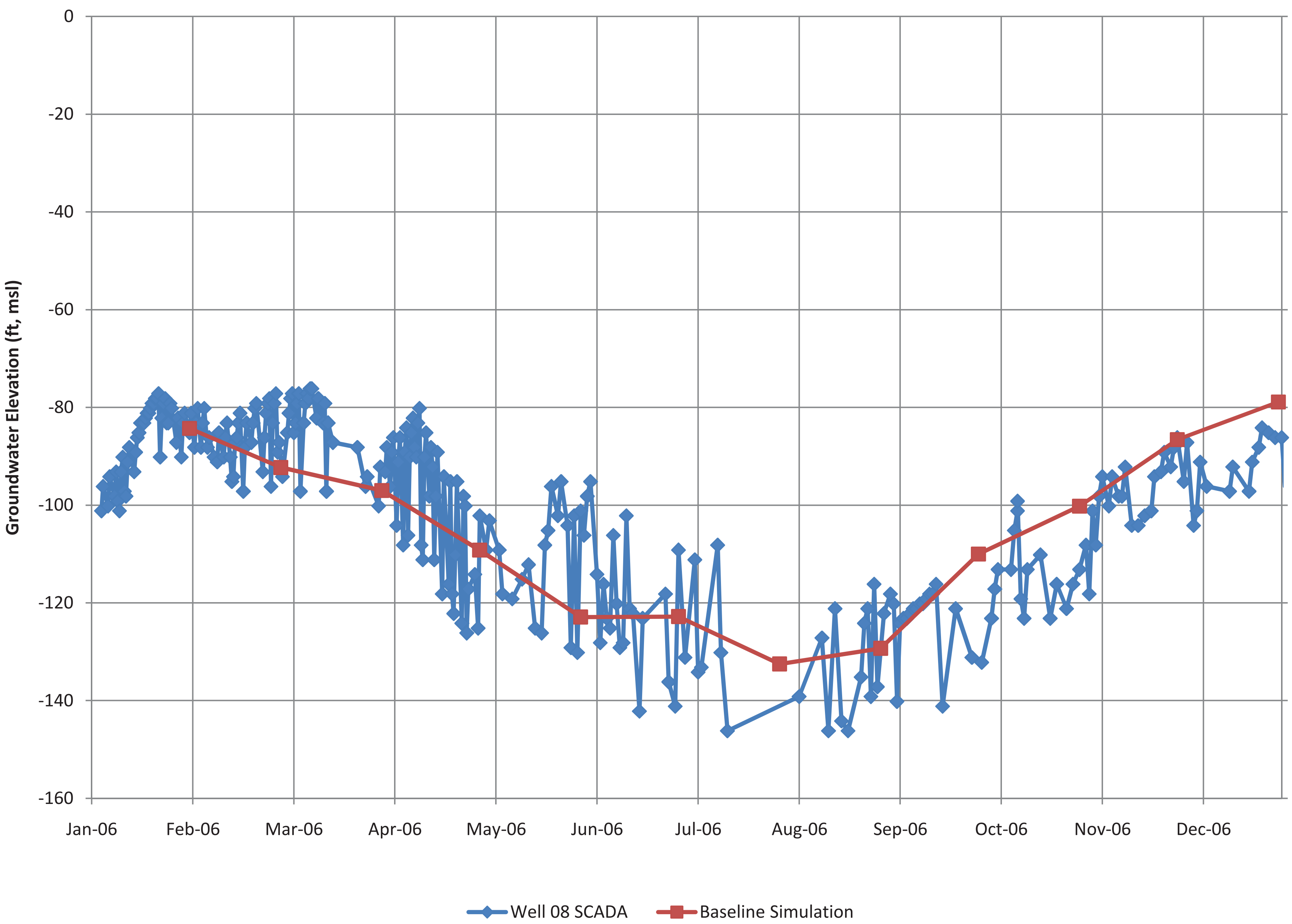


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**Figure B-2**
**Measured Groundwater Elevation and Simulated Water Levels for Calibration, Well 08**

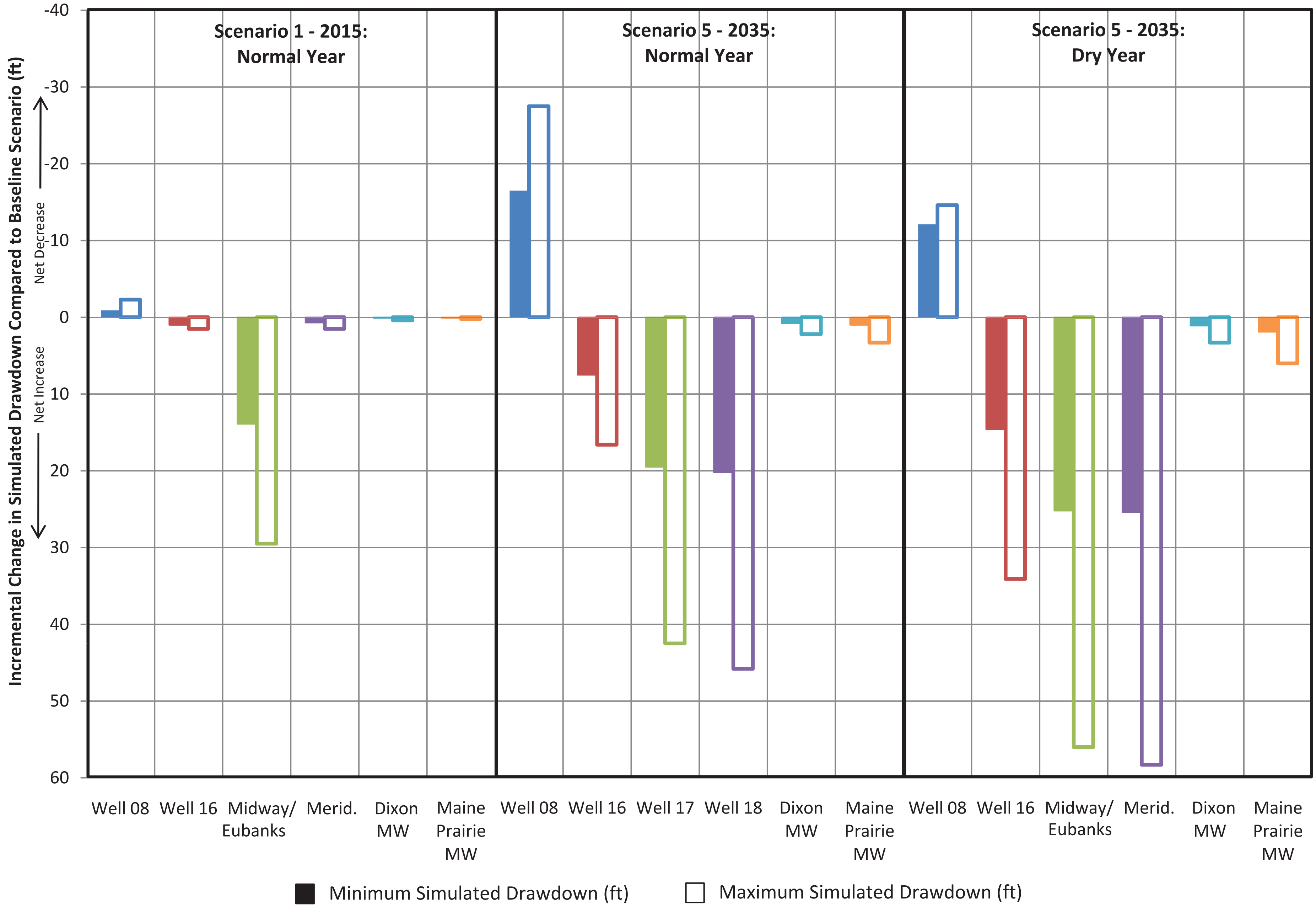


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**Figure B-3**
**n remental C ange in Simulated rawdown**
**20 and 203 ormal ears and 203 r ear**

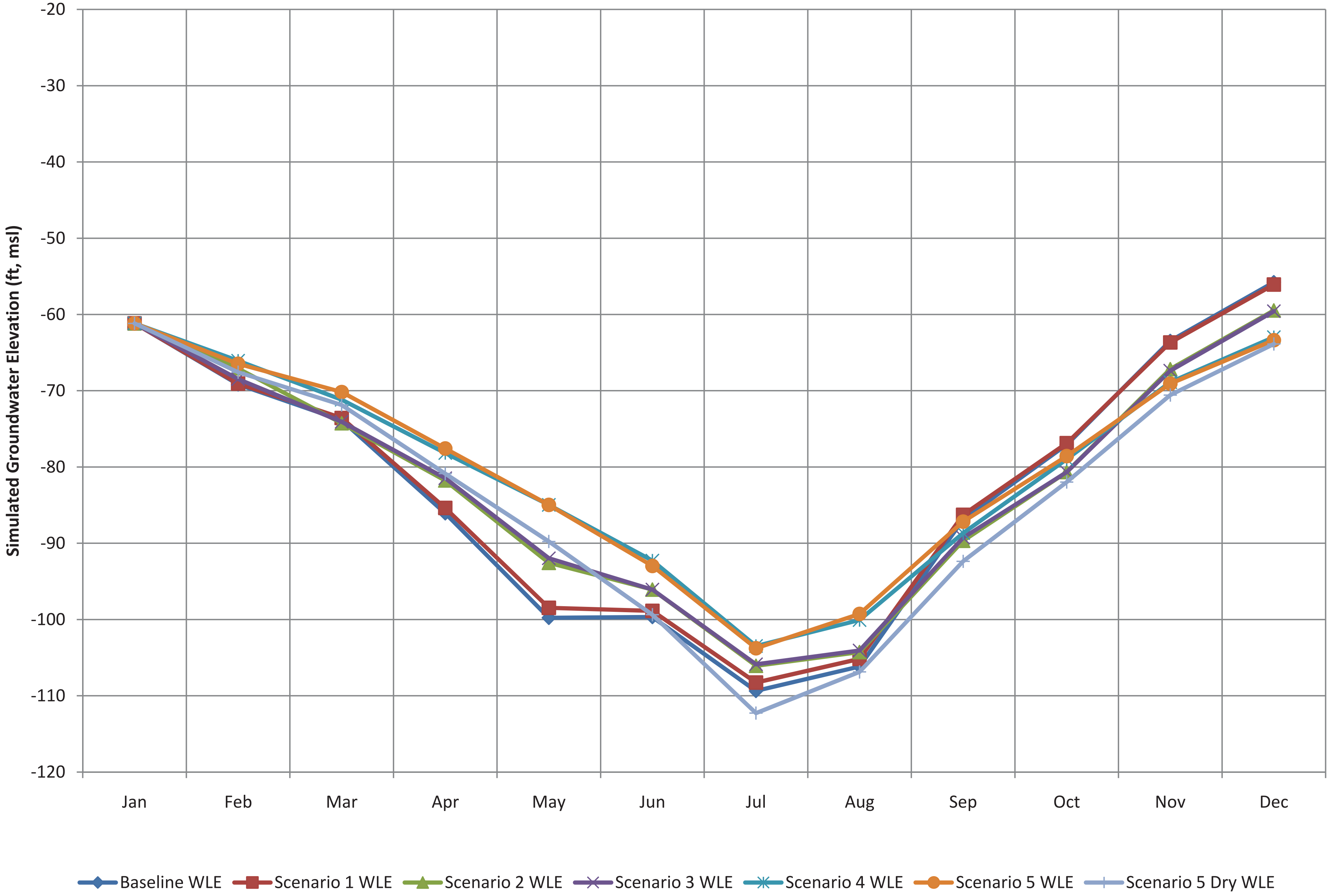


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**Figure B-**
**Simulated Groundwater Elevations**
**Well 08**

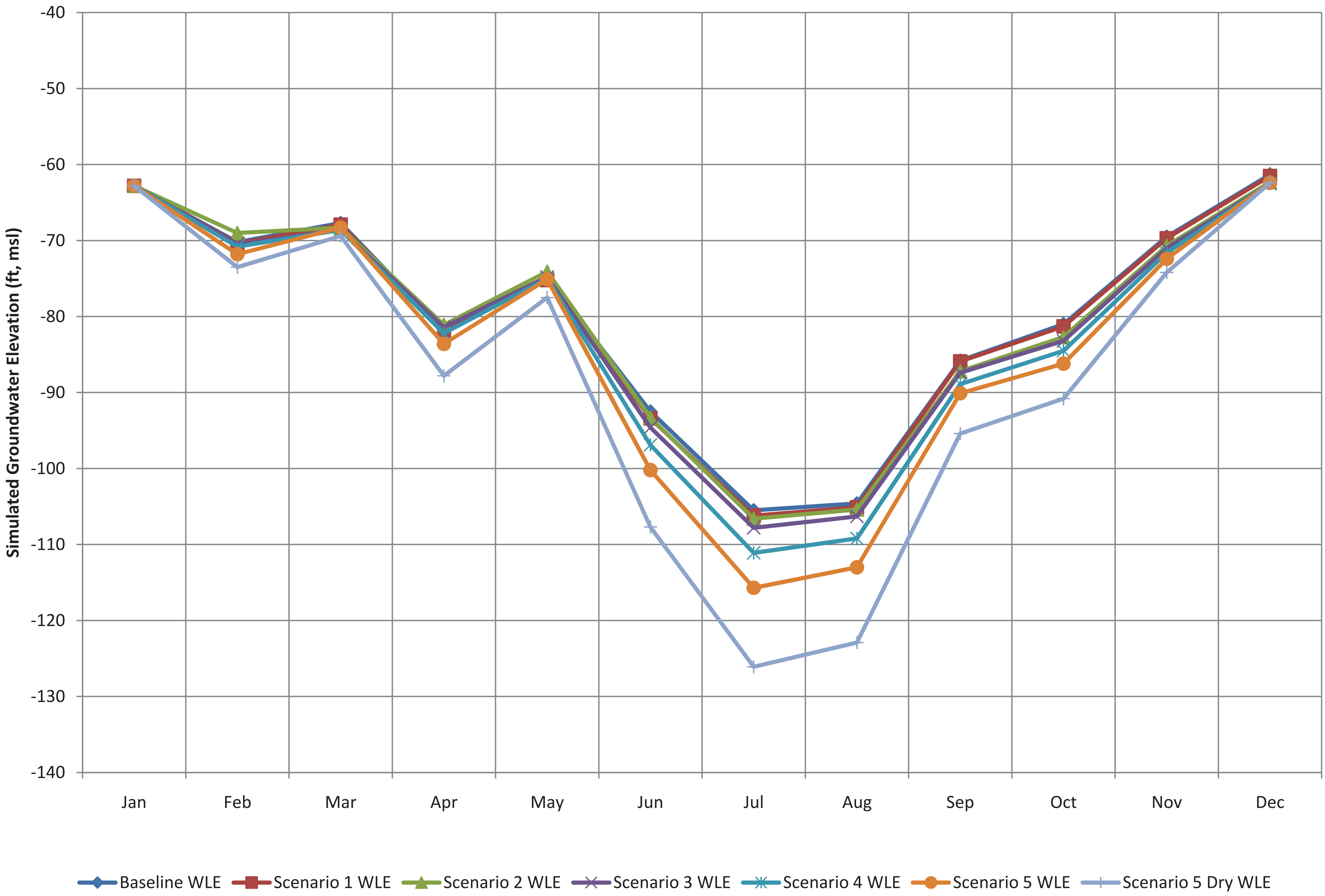


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**Figure B-**
**Simulated Groundwater Elevations**
**Well**

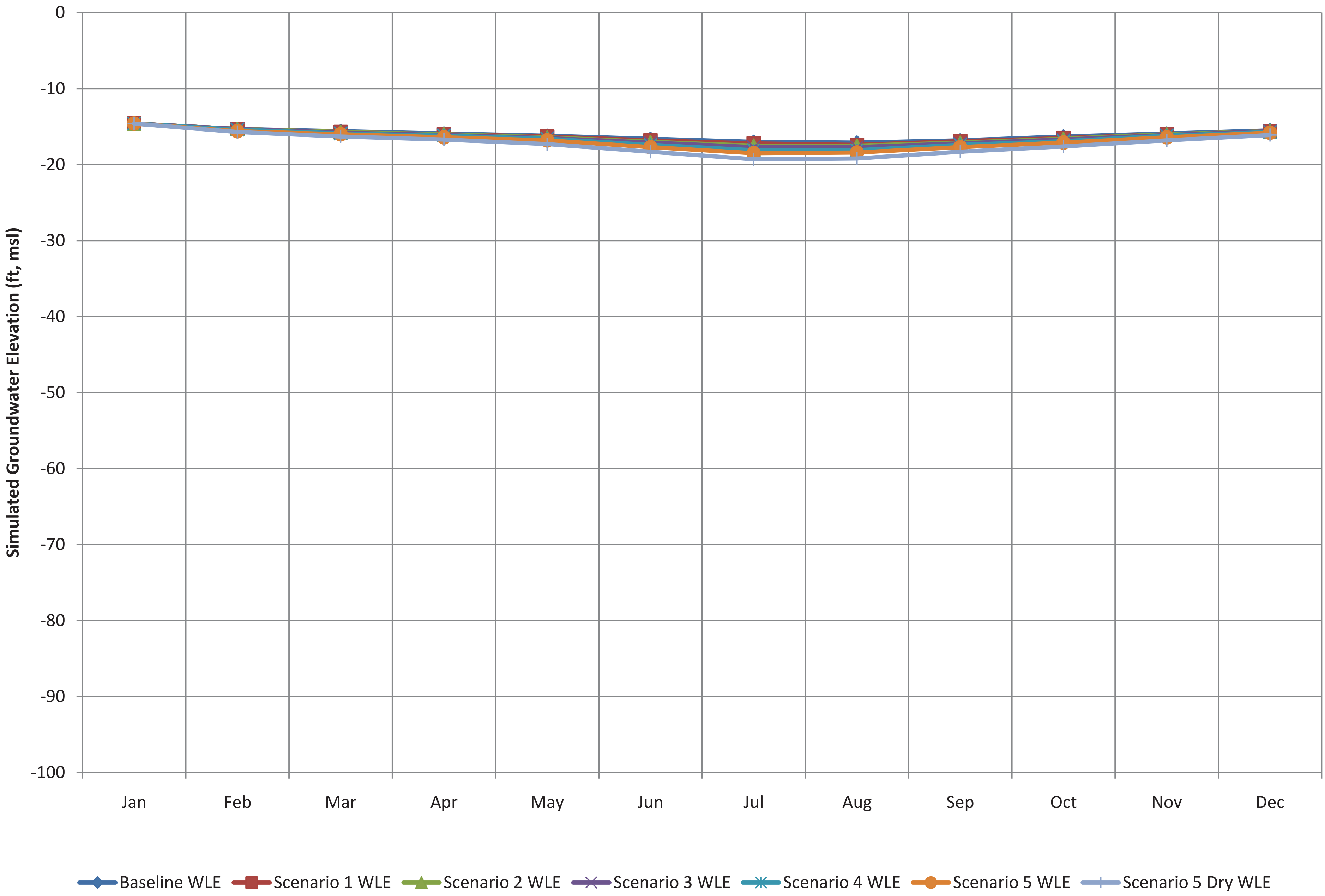


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**Figure B-**
**Simulated Groundwater Elevations**
**i on MW**

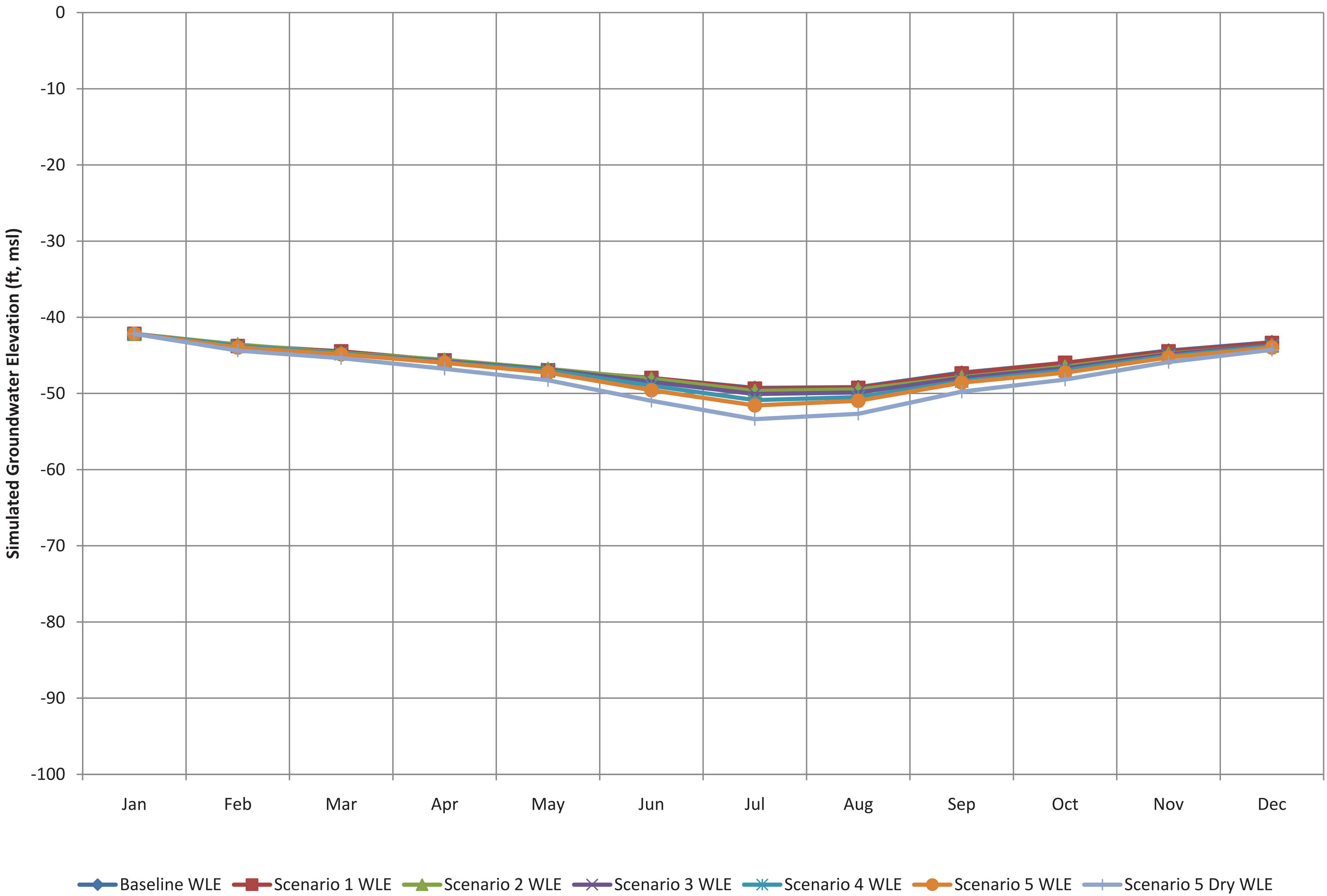


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**Figure B-**
**Simulated Groundwater Elevations**
**Maine rairie MW**

Attachment A Mont l and nnual um age mounts, aseline and Future S enarios

## City of Vacaville Monthly Pumping Distribution (AF) for Baseline Scenario

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 27.50 | 26.74 | 51.79 | 55.24 | 60.69 | 63.33 | 85.25 | 90.86 | 76.71 | 54.70 | 33.07 | 24.13 | 650.00 |
| **Well 03** | 28.79 | 27.70 | 36.00 | 39.38 | 50.39 | 53.28 | 96.32 | 99.64 | 85.06 | 62.76 | 41.61 | 29.06 | 650.00 |
| **Well 05** | 28.94 | 31.91 | 45.04 | 52.74 | 62.50 | 73.21 | 88.85 | 79.54 | 67.72 | 53.27 | 37.65 | 28.62 | 650.00 |
| **Well 06** | 53.05 | 52.30 | 47.87 | 80.95 | 103.39 | 75.09 | 75.56 | 62.46 | 26.20 | 23.98 | 23.46 | 25.69 | 650.00 |
| **Well 08** | 46.69 | 49.06 | 56.14 | 56.63 | 69.69 | 60.95 | 61.34 | 64.76 | 50.91 | 54.34 | 42.26 | 37.22 | 650.00 |
| **Well 09** | 33.98 | 37.37 | 51.87 | 53.41 | 69.51 | 75.07 | 91.85 | 79.30 | 60.52 | 38.18 | 23.49 | 35.45 | 650.00 |
| **Well 13** | 24.87 | 25.46 | 30.19 | 62.87 | 83.95 | 74.03 | 90.00 | 80.18 | 54.93 | 54.69 | 41.71 | 27.12 | 650.00 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **4550.00** |
| **Well 14** | 41.54 | 43.98 | 51.52 | 48.38 | 79.25 | 98.29 | 87.56 | 71.07 | 50.63 | 23.07 | 27.56 | 27.17 | 650.00 |
| **Well 15** | 41.25 | 39.02 | 45.64 | 36.98 | 48.63 | 64.92 | 71.72 | 63.82 | 39.24 | 87.21 | 60.71 | 50.86 | 650.00 |
| **Well 16** | 37.17 | 43.14 | 34.69 | 62.28 | 29.23 | 64.50 | 90.12 | 93.21 | 62.21 | 59.25 | 42.50 | 31.69 | 650.00 |
| **Well Midway/Eubanks Dr** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Meridian Rd** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Willow Drive** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Weber/Byrnes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | | | | | | **Northeast Annual Total:** | **1950.00** |
| | | | | | | | | | | | | **Annual Total:** | **6500.00** |

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 1

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 26.34 | 25.62 | 49.62 | 52.92 | 58.14 | 60.67 | 81.68 | 87.05 | 73.49 | 52.40 | 31.68 | 23.12 | 622.73 |
| **Well 03** | 27.59 | 26.54 | 34.49 | 37.73 | 48.28 | 51.04 | 92.28 | 95.46 | 81.49 | 60.13 | 39.86 | 27.84 | 622.73 |
| **Well 05** | 27.73 | 30.57 | 43.15 | 50.53 | 59.87 | 70.14 | 85.12 | 76.20 | 64.88 | 51.04 | 36.07 | 27.42 | 622.73 |
| **Well 06** | 50.82 | 50.11 | 45.86 | 77.55 | 99.05 | 71.94 | 72.39 | 59.84 | 25.10 | 22.97 | 22.48 | 24.61 | 622.73 |
| **Well 08** | 44.73 | 47.00 | 53.78 | 54.26 | 66.77 | 58.39 | 58.76 | 62.04 | 48.78 | 52.06 | 40.49 | 35.66 | 622.73 |
| **Well 09** | 32.55 | 35.81 | 49.69 | 51.17 | 66.60 | 71.92 | 87.99 | 75.97 | 57.98 | 36.57 | 22.50 | 33.97 | 622.73 |
| **Well 13** | 23.83 | 24.39 | 28.93 | 60.23 | 80.42 | 70.92 | 86.23 | 76.81 | 52.62 | 52.40 | 39.96 | 25.99 | 622.73 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **4359.09** |
| **Well 14** | 39.80 | 42.13 | 49.36 | 46.35 | 75.93 | 94.17 | 83.88 | 68.08 | 48.51 | 22.10 | 26.40 | 26.03 | 622.73 |
| **Well 15** | 39.52 | 37.38 | 43.72 | 35.43 | 46.59 | 62.20 | 68.71 | 61.14 | 37.60 | 83.55 | 58.16 | 48.73 | 622.73 |
| **Well 16** | 35.61 | 41.33 | 33.24 | 59.67 | 28.00 | 61.80 | 86.34 | 89.30 | 59.60 | 56.77 | 40.72 | 30.36 | 622.73 |
| **Well Midway/Eubanks Dr** | 38.31 | 40.28 | 42.10 | 47.15 | 50.17 | 72.72 | 79.64 | 72.84 | 48.57 | 54.14 | 41.76 | 35.04 | 622.73 |
| **Well Meridian Rd** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Willow Drive** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Weber/Byrnes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | | | | | | **Other City Annual Total:** | **2490.91** |
| | | | | | | | | | | | | **Annual Total:** | **6850.00** |

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 2

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 26.34 | 25.62 | 49.62 | 52.92 | 58.14 | 60.67 | 81.68 | 87.05 | 73.49 | 52.40 | 31.68 | 23.12 | 622.73 |
| **Well 03** | 27.59 | 26.54 | 34.49 | 37.73 | 48.28 | 51.04 | 92.28 | 95.46 | 81.49 | 60.13 | 39.86 | 27.84 | 622.73 |
| **Well 05** | 27.73 | 30.57 | 43.15 | 50.53 | 59.87 | 70.14 | 85.12 | 76.20 | 64.88 | 51.04 | 36.07 | 27.42 | 622.73 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 44.73 | 47.00 | 53.78 | 54.26 | 66.77 | 58.39 | 58.76 | 62.04 | 48.78 | 52.06 | 40.49 | 35.66 | 622.73 |
| **Well 09** | 32.55 | 35.81 | 49.69 | 51.17 | 66.60 | 71.92 | 87.99 | 75.97 | 57.98 | 36.57 | 22.50 | 33.97 | 622.73 |
| **Well 13** | 23.83 | 24.39 | 28.93 | 60.23 | 80.42 | 70.92 | 86.23 | 76.81 | 52.62 | 52.40 | 39.96 | 25.99 | 622.73 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **3736.36** |
| **Well 14** | 39.80 | 42.13 | 49.36 | 46.35 | 75.93 | 94.17 | 83.88 | 68.08 | 48.51 | 22.10 | 26.40 | 26.03 | 622.73 |
| **Well 15** | 39.52 | 37.38 | 43.72 | 35.43 | 46.59 | 62.20 | 68.71 | 61.14 | 37.60 | 83.55 | 58.16 | 48.73 | 622.73 |
| **Well 16** | 35.61 | 41.33 | 33.24 | 59.67 | 28.00 | 61.80 | 86.34 | 89.30 | 59.60 | 56.77 | 40.72 | 30.36 | 622.73 |
| **Well Midway/Eubanks Dr** | 38.31 | 40.28 | 42.10 | 47.15 | 50.17 | 72.72 | 79.64 | 72.84 | 48.57 | 54.14 | 41.76 | 35.04 | 622.73 |
| **Well Meridian Rd** | 37.18 | 34.51 | 51.74 | 50.22 | 64.37 | 69.94 | 83.03 | 61.04 | 55.81 | 48.07 | 31.58 | 35.22 | 622.73 |
| **Well Willow Drive** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Weber/Byrnes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | | | | | | **Other City Annual Total:** | **3113.64** |
| | | | | | | | | | | | | **Annual Total:** | **6850.00** |

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 3

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 25.38 | 24.68 | 47.81 | 50.99 | 56.02 | 58.46 | 78.70 | 83.87 | 70.81 | 50.49 | 30.52 | 22.27 | 600.00 |
| **Well 03** | 26.58 | 25.57 | 33.23 | 36.35 | 46.52 | 49.18 | 88.91 | 91.97 | 78.51 | 57.93 | 38.41 | 26.83 | 600.00 |
| **Well 05** | 26.72 | 29.46 | 41.58 | 48.68 | 57.69 | 67.58 | 82.02 | 73.42 | 62.51 | 49.17 | 34.75 | 26.42 | 600.00 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 43.10 | 45.29 | 51.82 | 52.28 | 64.33 | 56.26 | 56.62 | 59.78 | 47.00 | 50.16 | 39.01 | 34.36 | 600.00 |
| **Well 09** | 31.36 | 34.50 | 47.88 | 49.30 | 64.17 | 69.30 | 84.78 | 73.20 | 55.87 | 35.24 | 21.68 | 32.73 | 600.00 |
| **Well 13** | 22.96 | 23.50 | 27.87 | 58.03 | 77.49 | 68.34 | 83.08 | 74.01 | 50.70 | 50.49 | 38.50 | 25.04 | 600.00 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **3600.00** |
| **Well 14** | 38.34 | 40.59 | 47.55 | 44.66 | 73.16 | 90.73 | 80.82 | 65.60 | 46.74 | 21.29 | 25.44 | 25.08 | 600.00 |
| **Well 15** | 38.08 | 36.02 | 42.13 | 34.13 | 44.89 | 59.93 | 66.20 | 58.91 | 36.22 | 80.50 | 56.04 | 46.95 | 600.00 |
| **Well 16** | 34.31 | 39.82 | 32.02 | 57.49 | 26.98 | 59.54 | 83.19 | 86.04 | 57.42 | 54.69 | 39.23 | 29.25 | 600.00 |
| **Well Midway/Eubanks Dr** | 36.91 | 38.81 | 40.57 | 45.43 | 48.34 | 70.07 | 76.74 | 70.18 | 46.79 | 52.16 | 40.24 | 33.76 | 600.00 |
| **Well Meridian Rd** | 35.82 | 33.25 | 49.86 | 48.38 | 62.02 | 67.39 | 80.00 | 58.81 | 53.78 | 46.32 | 30.43 | 33.93 | 600.00 |
| **Well Willow Drive** | 36.91 | 38.81 | 40.57 | 45.43 | 48.34 | 70.07 | 76.74 | 70.18 | 46.79 | 52.16 | 40.24 | 33.76 | 600.00 |
| **Well Weber/Byrnes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | | | | | | **Other City Annual Total:** | **3600.00** |
| | | | | | | | | | | | | **Annual Total:** | **7200.00** |

Attachment A Mont l and nnual um age mounts, aseline and Future S enarios

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 4

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 26.62 | 25.88 | 50.13 | 53.47 | 58.74 | 61.30 | 82.52 | 87.95 | 74.25 | 52.95 | 32.01 | 23.36 | 629.17 |
| **Well 03** | 27.87 | 26.81 | 34.84 | 38.12 | 48.78 | 51.57 | 93.24 | 96.45 | 82.33 | 60.75 | 40.28 | 28.13 | 629.17 |
| **Well 05** | 28.02 | 30.89 | 43.60 | 51.05 | 60.49 | 70.86 | 86.00 | 76.99 | 65.55 | 51.56 | 36.44 | 27.70 | 629.17 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 09** | 32.89 | 36.18 | 50.21 | 51.70 | 67.29 | 72.67 | 88.90 | 76.76 | 58.58 | 36.95 | 22.74 | 34.32 | 629.17 |
| **Well 13** | 24.07 | 24.64 | 29.23 | 60.85 | 81.25 | 71.66 | 87.12 | 77.61 | 53.17 | 52.94 | 40.37 | 26.25 | 629.17 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **3145.83** |
| **Well 14** | 40.21 | 42.57 | 49.87 | 46.83 | 76.71 | 95.14 | 84.75 | 68.79 | 49.01 | 22.33 | 26.67 | 26.30 | 629.17 |
| **Well 15** | 39.93 | 37.77 | 44.18 | 35.79 | 47.07 | 62.84 | 69.42 | 61.77 | 37.99 | 84.41 | 58.76 | 49.23 | 629.17 |
| **Well 16** | 35.98 | 41.76 | 33.58 | 60.28 | 28.29 | 62.44 | 87.23 | 90.22 | 60.21 | 57.35 | 41.14 | 30.68 | 629.17 |
| **Well Midway/Eubanks Dr** | 38.71 | 40.70 | 42.54 | 47.64 | 50.69 | 73.47 | 80.47 | 73.59 | 49.07 | 54.70 | 42.19 | 35.40 | 629.17 |
| **Well Meridian Rd** | 37.56 | 34.87 | 52.28 | 50.74 | 65.04 | 70.67 | 83.89 | 61.67 | 56.39 | 48.57 | 31.91 | 35.58 | 629.17 |
| **Well Willow Drive** | 38.71 | 40.70 | 42.54 | 47.64 | 50.69 | 73.47 | 80.47 | 73.59 | 49.07 | 54.70 | 42.19 | 35.40 | 629.17 |
| **Well Weber/Byrnes** | 38.71 | 40.70 | 42.54 | 47.64 | 50.69 | 73.47 | 80.47 | 73.59 | 49.07 | 54.70 | 42.19 | 35.40 | 629.17 |
| | | | | | | | | | | | | **Other City Annual Total:** | **4404.17** |
| | | | | | | | | | | | | **Annual Total:** | **7550.00** |

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 5

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 03** | 32.22 | 30.99 | 40.28 | 44.06 | 56.38 | 59.61 | 107.78 | 111.48 | 95.17 | 70.22 | 46.56 | 32.52 | 727.27 |
| **Well 05** | 32.38 | 35.71 | 50.40 | 59.01 | 69.92 | 81.91 | 99.42 | 89.00 | 75.77 | 59.60 | 42.13 | 32.02 | 727.27 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 09** | 38.01 | 41.82 | 58.04 | 59.76 | 77.78 | 84.00 | 102.77 | 88.72 | 67.72 | 42.71 | 26.28 | 39.67 | 727.27 |
| **Well 13** | 27.83 | 28.48 | 33.78 | 70.34 | 93.92 | 82.83 | 100.70 | 89.71 | 61.46 | 61.20 | 46.67 | 30.35 | 727.27 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **2909.09** |
| **Well 14** | 46.48 | 49.20 | 57.64 | 54.13 | 88.68 | 109.98 | 97.96 | 79.51 | 56.65 | 25.81 | 30.83 | 30.40 | 727.27 |
| **Well 15** | 46.16 | 43.66 | 51.06 | 41.38 | 54.41 | 72.64 | 80.25 | 71.40 | 43.91 | 97.57 | 67.93 | 56.91 | 727.27 |
| **Well 16** | 41.59 | 48.27 | 38.82 | 69.68 | 32.71 | 72.17 | 100.84 | 104.29 | 69.60 | 66.30 | 47.55 | 35.46 | 727.27 |
| **Well Midway/Eubanks Dr** | 44.74 | 47.04 | 49.17 | 55.06 | 58.60 | 84.93 | 93.02 | 85.07 | 56.72 | 63.23 | 48.77 | 40.92 | 727.27 |
| **Well Meridian Rd** | 43.42 | 40.31 | 60.43 | 58.65 | 75.18 | 81.69 | 96.97 | 71.29 | 65.18 | 56.15 | 36.89 | 41.13 | 727.27 |
| **Well Willow Drive** | 44.74 | 47.04 | 49.17 | 55.06 | 58.60 | 84.93 | 93.02 | 85.07 | 56.72 | 63.23 | 48.77 | 40.92 | 727.27 |
| **Well Weber/Byrnes** | 44.74 | 47.04 | 49.17 | 55.06 | 58.60 | 84.93 | 93.02 | 85.07 | 56.72 | 63.23 | 48.77 | 40.92 | 727.27 |
| | | | | | | | | | | | | **Other City Annual Total:** | **5090.91** |
| | | | | | | | | | | | | **Annual Total:** | **8000.00** |

**Attachment A Mont l and nnual um age mounts, aseline and Future S enarios**

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 1 Dry Year

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 31.61 | 30.74 | 59.55 | 63.50 | 69.77 | 72.81 | 98.01 | 104.46 | 88.19 | 62.89 | 38.02 | 27.74 | 747.27 |
| **Well 03** | 33.10 | 31.85 | 41.39 | 45.27 | 57.93 | 61.25 | 110.74 | 114.55 | 97.79 | 72.15 | 47.84 | 33.41 | 747.27 |
| **Well 05** | 33.28 | 36.69 | 51.78 | 60.63 | 71.85 | 84.17 | 102.15 | 91.44 | 77.86 | 61.24 | 43.29 | 32.90 | 747.27 |
| **Well 06** | 60.99 | 60.13 | 55.03 | 93.06 | 118.86 | 86.33 | 86.86 | 71.81 | 30.12 | 27.57 | 26.97 | 29.54 | 747.27 |
| **Well 08** | 53.68 | 56.40 | 64.54 | 65.11 | 80.12 | 70.07 | 70.52 | 74.45 | 58.53 | 62.47 | 48.59 | 42.80 | 747.27 |
| **Well 09** | 39.06 | 42.97 | 59.63 | 61.40 | 79.92 | 86.31 | 105.59 | 91.16 | 69.58 | 43.89 | 27.00 | 40.76 | 747.27 |
| **Well 13** | 28.59 | 29.27 | 34.71 | 72.28 | 96.51 | 85.11 | 103.47 | 92.18 | 63.15 | 62.88 | 47.95 | 31.18 | 747.27 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **5230.91** |
| **Well 14** | 47.75 | 50.56 | 59.23 | 55.62 | 91.11 | 113.00 | 100.66 | 81.70 | 58.21 | 26.52 | 31.68 | 31.23 | 747.27 |
| **Well 15** | 47.43 | 44.86 | 52.47 | 42.51 | 55.91 | 74.64 | 82.45 | 73.37 | 45.12 | 100.26 | 69.79 | 58.48 | 747.27 |
| **Well 16** | 42.73 | 49.59 | 39.88 | 71.60 | 33.60 | 74.16 | 103.61 | 107.16 | 71.52 | 68.12 | 48.86 | 36.44 | 747.27 |
| **Well Midway/Eubanks Dr** | 45.97 | 48.34 | 50.53 | 56.58 | 60.21 | 87.26 | 95.57 | 87.41 | 58.28 | 64.97 | 50.11 | 42.05 | 747.27 |
| **Well Meridian Rd** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Willow Drive** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Weber/Byrnes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | | | | | | **Other City Annual Total:** | **2989.09** |
| | | | | | | | | | | | | **Annual Total:** | **8220.00** |

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 2 Dry Year

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 31.61 | 30.74 | 59.55 | 63.50 | 69.77 | 72.81 | 98.01 | 104.46 | 88.19 | 62.89 | 38.02 | 27.74 | 747.27 |
| **Well 03** | 33.10 | 31.85 | 41.39 | 45.27 | 57.93 | 61.25 | 110.74 | 114.55 | 97.79 | 72.15 | 47.84 | 33.41 | 747.27 |
| **Well 05** | 33.28 | 36.69 | 51.78 | 60.63 | 71.85 | 84.17 | 102.15 | 91.44 | 77.86 | 61.24 | 43.29 | 32.90 | 747.27 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 53.68 | 56.40 | 64.54 | 65.11 | 80.12 | 70.07 | 70.52 | 74.45 | 58.53 | 62.47 | 48.59 | 42.80 | 747.27 |
| **Well 09** | 39.06 | 42.97 | 59.63 | 61.40 | 79.92 | 86.31 | 105.59 | 91.16 | 69.58 | 43.89 | 27.00 | 40.76 | 747.27 |
| **Well 13** | 28.59 | 29.27 | 34.71 | 72.28 | 96.51 | 85.11 | 103.47 | 92.18 | 63.15 | 62.88 | 47.95 | 31.18 | 747.27 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **4483.64** |
| **Well 14** | 47.75 | 50.56 | 59.23 | 55.62 | 91.11 | 113.00 | 100.66 | 81.70 | 58.21 | 26.52 | 31.68 | 31.23 | 747.27 |
| **Well 15** | 47.43 | 44.86 | 52.47 | 42.51 | 55.91 | 74.64 | 82.45 | 73.37 | 45.12 | 100.26 | 69.79 | 58.48 | 747.27 |
| **Well 16** | 42.73 | 49.59 | 39.88 | 71.60 | 33.60 | 74.16 | 103.61 | 107.16 | 71.52 | 68.12 | 48.86 | 36.44 | 747.27 |
| **Well Midway/Eubanks Dr** | 45.97 | 48.34 | 50.53 | 56.58 | 60.21 | 87.26 | 95.57 | 87.41 | 58.28 | 64.97 | 50.11 | 42.05 | 747.27 |
| **Well Meridian Rd** | 44.62 | 41.42 | 62.09 | 60.26 | 77.25 | 83.93 | 99.63 | 73.25 | 66.97 | 57.69 | 37.90 | 42.26 | 747.27 |
| **Well Willow Drive** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well Weber/Byrnes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | | | | | | **Other City Annual Total:** | **3736.36** |
| | | | | | | | | | | | | **Annual Total:** | **8220.00** |

Attachment A Mont l and nnual um age mounts, aseline and Future S enarios

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 3 Dry Year

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 30.46 | 29.62 | 57.37 | 61.18 | 67.22 | 70.15 | 94.44 | 100.64 | 84.97 | 60.59 | 36.63 | 26.73 | 720.00 |
| **Well 03** | 31.90 | 30.68 | 39.87 | 43.62 | 55.82 | 59.02 | 106.70 | 110.37 | 94.22 | 69.52 | 46.09 | 32.19 | 720.00 |
| **Well 05** | 32.06 | 35.35 | 49.89 | 58.42 | 69.23 | 81.09 | 98.42 | 88.11 | 75.02 | 59.01 | 41.71 | 31.70 | 720.00 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 51.72 | 54.34 | 62.18 | 62.73 | 77.19 | 67.51 | 67.94 | 71.74 | 56.40 | 60.19 | 46.81 | 41.23 | 720.00 |
| **Well 09** | 37.63 | 41.40 | 57.46 | 59.16 | 77.00 | 83.16 | 101.74 | 87.84 | 67.04 | 42.29 | 26.02 | 39.27 | 720.00 |
| **Well 13** | 27.55 | 28.20 | 33.44 | 69.64 | 92.99 | 82.00 | 99.70 | 88.81 | 60.84 | 60.58 | 46.20 | 30.05 | 720.00 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **4320.00** |
| **Well 14** | 46.01 | 48.71 | 57.06 | 53.59 | 87.79 | 108.88 | 96.99 | 78.72 | 56.08 | 25.55 | 30.52 | 30.09 | 720.00 |
| **Well 15** | 45.70 | 43.22 | 50.55 | 40.96 | 53.87 | 71.91 | 79.44 | 70.69 | 43.47 | 96.60 | 67.25 | 56.34 | 720.00 |
| **Well 16** | 41.17 | 47.78 | 38.43 | 68.99 | 32.38 | 71.45 | 99.83 | 103.25 | 68.91 | 65.63 | 47.08 | 35.11 | 720.00 |
| **Well Midway/Eubanks Dr** | 44.29 | 46.57 | 48.68 | 54.51 | 58.01 | 84.08 | 92.09 | 84.22 | 56.15 | 62.60 | 48.28 | 40.51 | 720.00 |
| **Well Meridian Rd** | 42.99 | 39.90 | 59.83 | 58.06 | 74.43 | 80.87 | 96.00 | 70.57 | 64.53 | 55.58 | 36.52 | 40.72 | 720.00 |
| **Well Willow Drive** | 44.29 | 46.57 | 48.68 | 54.51 | 58.01 | 84.08 | 92.09 | 84.22 | 56.15 | 62.60 | 48.28 | 40.51 | 720.00 |
| **Well Weber/Byrnes** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | | | | | | **Other City Annual Total:** | **4320.00** |
| | | | | | | | | | | | | **Annual Total:** | **8640.00** |

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 4 Dry Year

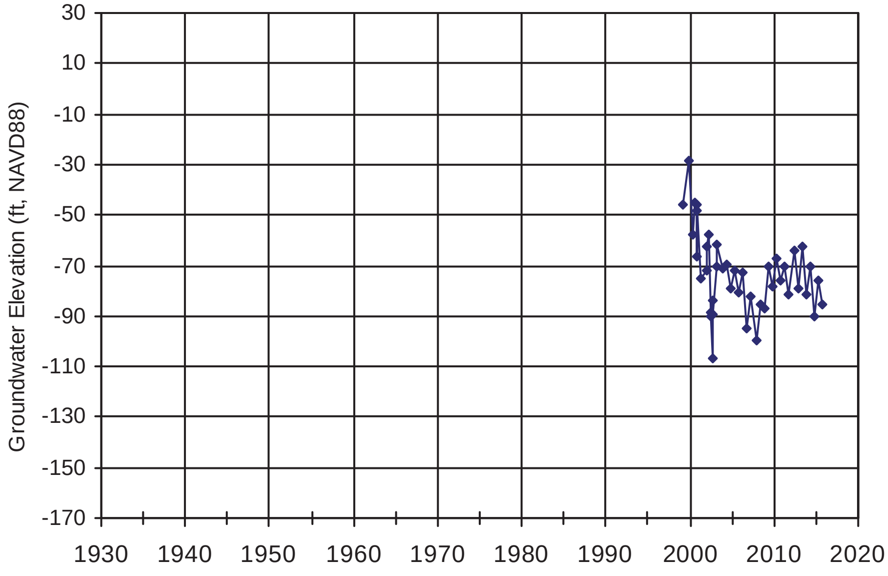
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 31.94 | 31.06 | 60.16 | 64.16 | 70.49 | 73.56 | 99.03 | 105.54 | 89.10 | 63.54 | 38.41 | 28.03 | 755.00 |
| **Well 03** | 33.45 | 32.18 | 41.81 | 45.74 | 58.53 | 61.89 | 111.88 | 115.73 | 98.80 | 72.90 | 48.33 | 33.76 | 755.00 |
| **Well 05** | 33.62 | 37.07 | 52.32 | 61.26 | 72.59 | 85.04 | 103.21 | 92.39 | 78.66 | 61.88 | 43.73 | 33.24 | 755.00 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 09** | 39.46 | 43.41 | 60.25 | 62.04 | 80.74 | 87.20 | 106.68 | 92.11 | 70.30 | 44.34 | 27.28 | 41.18 | 755.00 |
| **Well 13** | 28.89 | 29.57 | 35.07 | 73.02 | 97.51 | 85.99 | 104.54 | 93.13 | 63.80 | 63.53 | 48.44 | 31.51 | 755.00 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **3775.00** |
| **Well 14** | 48.25 | 51.08 | 59.84 | 56.20 | 92.06 | 114.17 | 101.70 | 82.55 | 58.81 | 26.80 | 32.01 | 31.55 | 755.00 |
| **Well 15** | 47.92 | 45.32 | 53.01 | 42.95 | 56.48 | 75.41 | 83.30 | 74.13 | 45.58 | 101.29 | 70.52 | 59.08 | 755.00 |
| **Well 16** | 43.17 | 50.11 | 40.30 | 72.34 | 33.95 | 74.92 | 104.68 | 108.27 | 72.26 | 68.82 | 49.37 | 36.81 | 755.00 |
| **Well Midway/Eubanks Dr** | 46.45 | 48.84 | 51.05 | 57.16 | 60.83 | 88.17 | 96.56 | 88.31 | 58.88 | 65.64 | 50.63 | 42.48 | 755.00 |
| **Well Meridian Rd** | 45.08 | 41.84 | 62.74 | 60.88 | 78.04 | 84.80 | 100.66 | 74.00 | 67.67 | 58.29 | 38.29 | 42.70 | 755.00 |
| **Well Willow Drive** | 46.45 | 48.84 | 51.05 | 57.16 | 60.83 | 88.17 | 96.56 | 88.31 | 58.88 | 65.64 | 50.63 | 42.48 | 755.00 |
| **Well Weber/Byrnes** | 46.45 | 48.84 | 51.05 | 57.16 | 60.83 | 88.17 | 96.56 | 88.31 | 58.88 | 65.64 | 50.63 | 42.48 | 755.00 |
| | | | | | | | | | | | | **Other City Annual Total:** | **5285.00** |
| | | | | | | | | | | | | **Annual Total:** | **9060.00** |

## City of Vacaville Monthly Pumping Distribution (AF) for Scenario 5 Dry Year

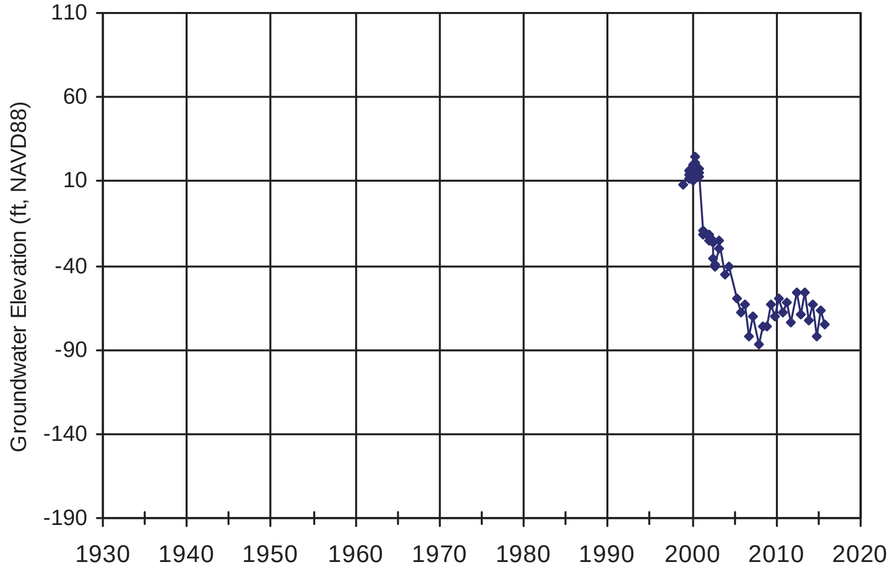
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well 02** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 03** | 38.66 | 37.19 | 48.33 | 52.88 | 67.66 | 71.54 | 129.33 | 133.78 | 114.20 | 84.27 | 55.87 | 39.02 | 872.73 |
| **Well 05** | 38.86 | 42.85 | 60.48 | 70.81 | 83.91 | 98.30 | 119.30 | 106.79 | 90.93 | 71.53 | 50.55 | 38.42 | 872.73 |
| **Well 06** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 08** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Well 09** | 45.62 | 50.18 | 69.65 | 71.71 | 93.33 | 100.80 | 123.32 | 106.47 | 81.26 | 51.26 | 31.54 | 47.60 | 872.73 |
| **Well 13** | 33.39 | 34.18 | 40.54 | 84.41 | 112.71 | 99.40 | 120.84 | 107.65 | 73.75 | 73.43 | 56.00 | 36.42 | 872.73 |
| | | | | | | | | | | | | **Elmira Annual Total:** | **3490.91** |
| **Well 14** | 55.77 | 59.04 | 69.17 | 64.96 | 106.41 | 131.97 | 117.56 | 95.42 | 67.98 | 30.97 | 37.00 | 36.47 | 872.73 |
| **Well 15** | 55.39 | 52.39 | 61.28 | 49.65 | 65.29 | 87.17 | 96.29 | 85.68 | 52.69 | 117.09 | 81.51 | 68.29 | 872.73 |
| **Well 16** | 49.91 | 57.92 | 46.58 | 83.62 | 39.25 | 86.61 | 121.00 | 125.15 | 83.52 | 79.56 | 57.06 | 42.55 | 872.73 |
| **Well Midway/Eubanks Dr** | 53.69 | 56.45 | 59.01 | 66.08 | 70.32 | 101.91 | 111.62 | 102.08 | 68.06 | 75.87 | 58.52 | 49.11 | 872.73 |
| **Well Meridian Rd** | 52.11 | 48.37 | 72.52 | 70.38 | 90.21 | 98.02 | 116.36 | 85.54 | 78.22 | 67.37 | 44.26 | 49.36 | 872.73 |
| **Well Willow Drive** | 53.69 | 56.45 | 59.01 | 66.08 | 70.32 | 101.91 | 111.62 | 102.08 | 68.06 | 75.87 | 58.52 | 49.11 | 872.73 |
| **Well Weber/Byrnes** | 53.69 | 56.45 | 59.01 | 66.08 | 70.32 | 101.91 | 111.62 | 102.08 | 68.06 | 75.87 | 58.52 | 49.11 | 872.73 |
| | | | | | | | | | | | | **Other City Annual Total:** | **6109.09** |
| | | | | | | | | | | | | **Annual Total:** | **9600.00** |

# APPENDIX C

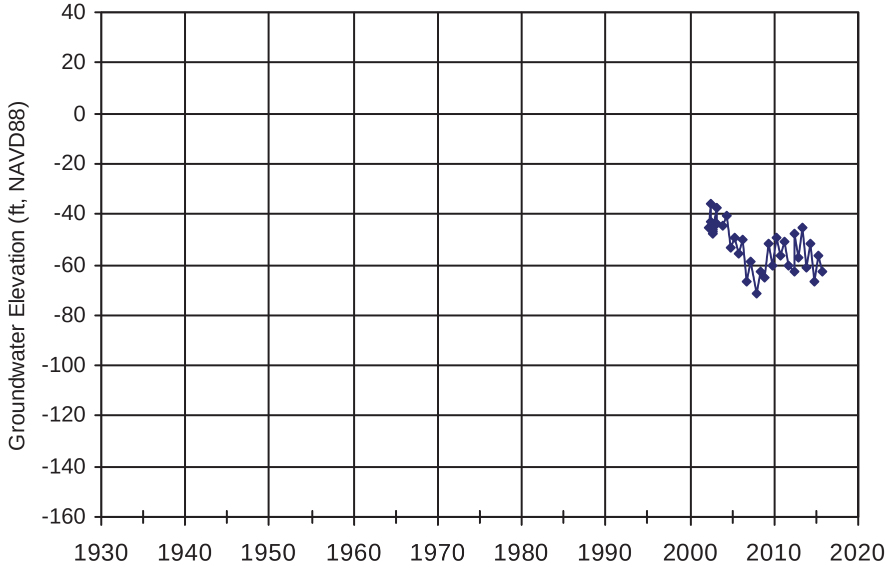
WellID: **MW-14** Source: CofV RPE: 92.98 ft, NAVD88
Aquifer Zone: Basal Tehama



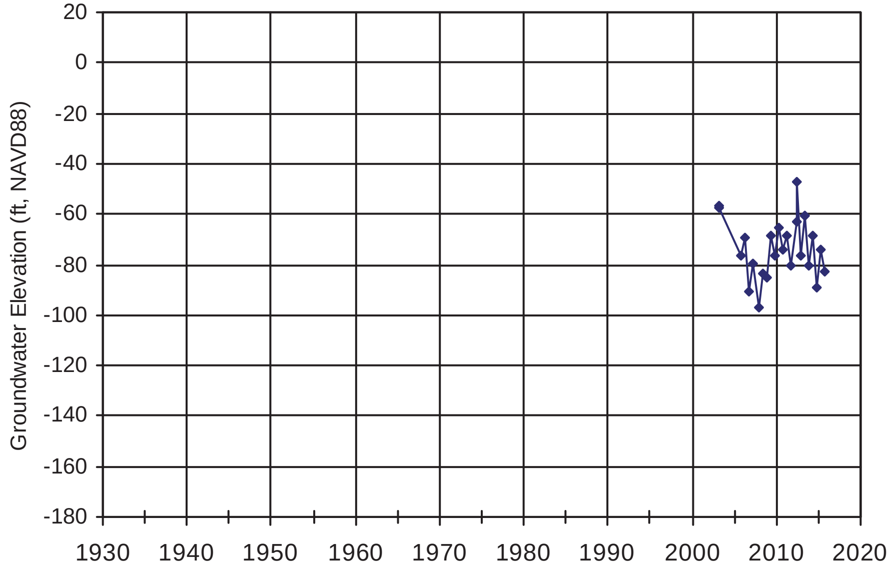

WellID: **MW-15-1815ft** Source: CofV RPE: 94.97 ft, NAVD88
Aquifer Zone: Basal Tehama



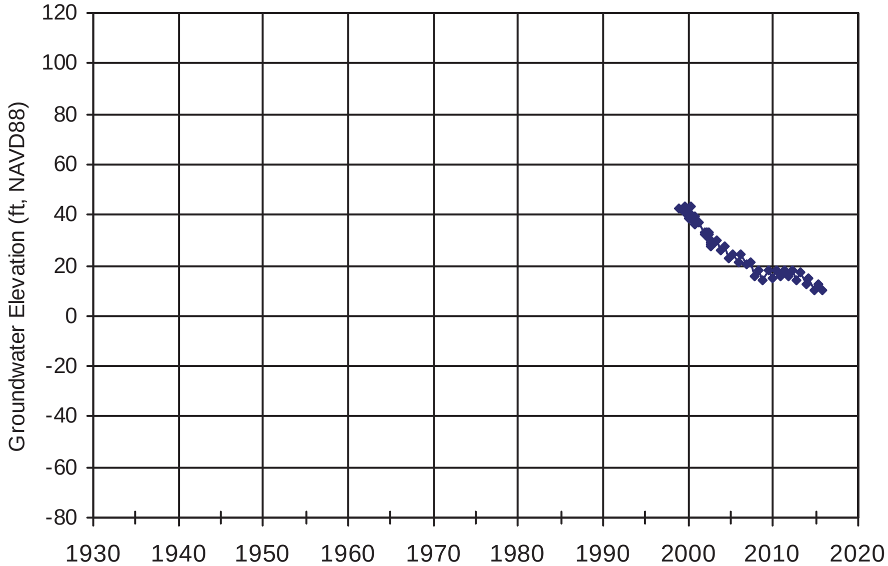

WellID: **MW-16-1166ft** Source: CofV RPE: 103.33 ft, NAVD88
Aquifer Zone: Basal Tehama



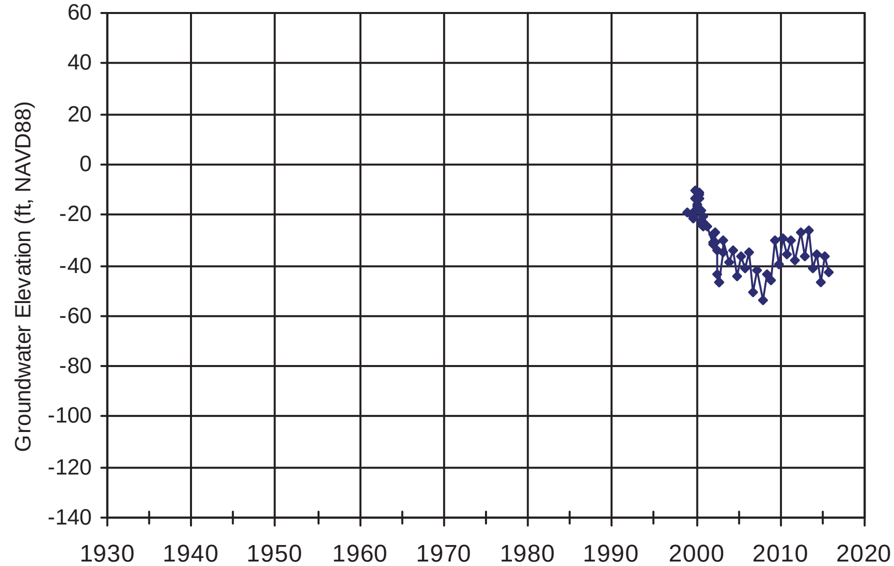

WellID: **MW-16-1430ft** Source: CofV RPE: 103.52 ft, NAVD88
Aquifer Zone: Basal Tehama



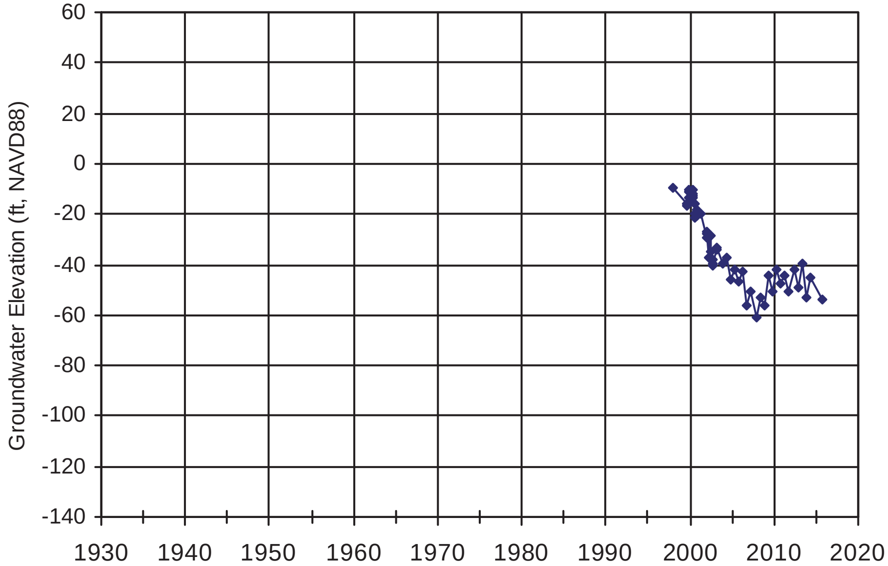
WellID: **MW-98A** Source: CofV RPE: 104.02 ft, NAVD88
Aquifer Zone: Basal Tehama



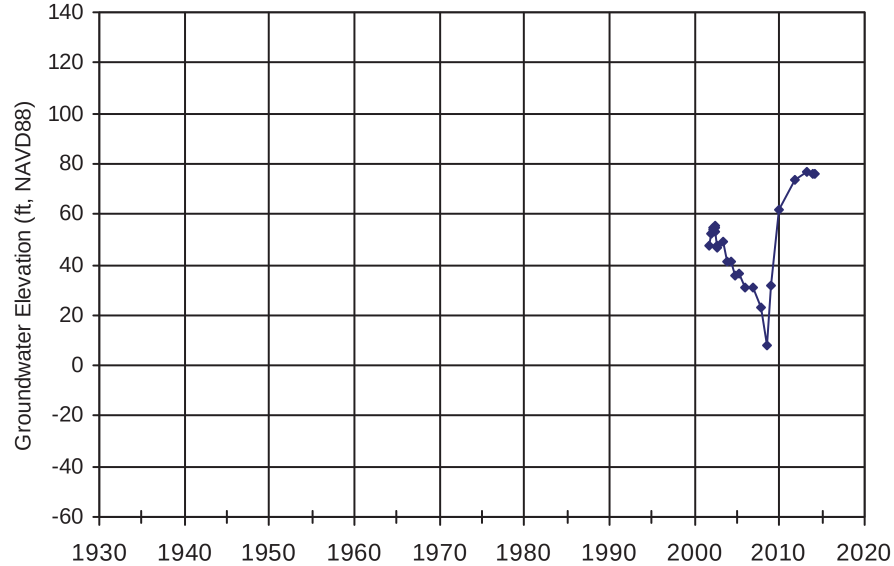

WellID: **MW-98B** Source: CofV RPE: 95.28 ft, NAVD88
Aquifer Zone: Basal Tehama



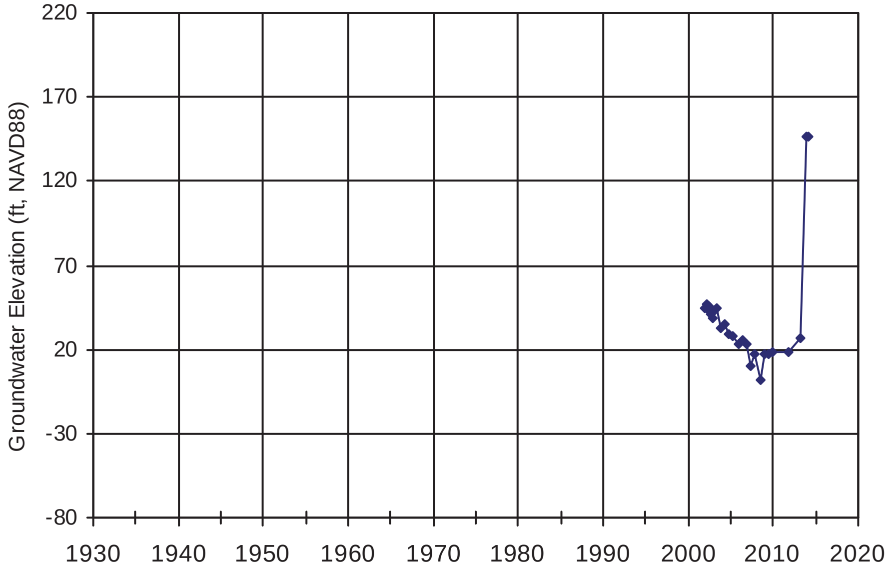

WellID: **MW-98C** Source: CofV RPE: 81.07 ft, NAVD88
Aquifer Zone: Basal Tehama



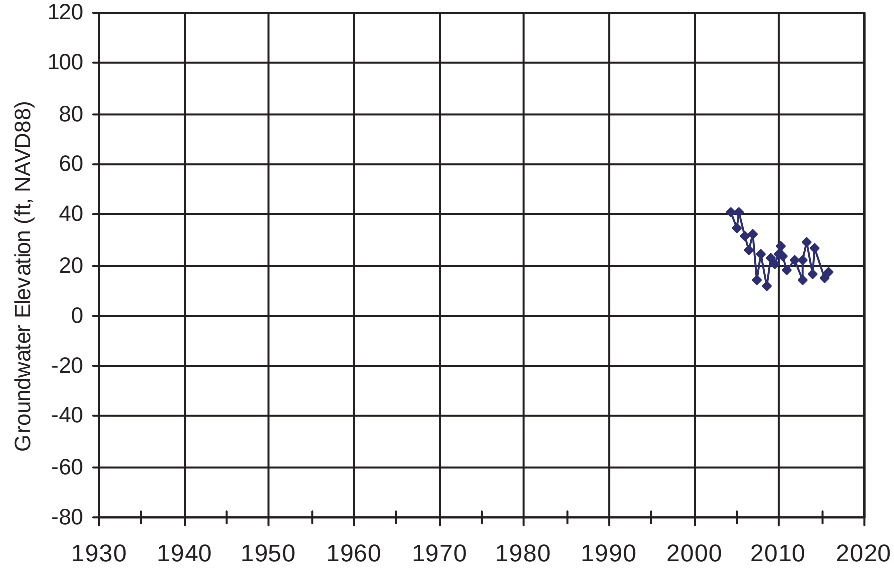

WellID: **RNVWD 1** Source: RNVWD RPE: 173.55 ft, NAVD88
Aquifer Zone: Basal Tehama



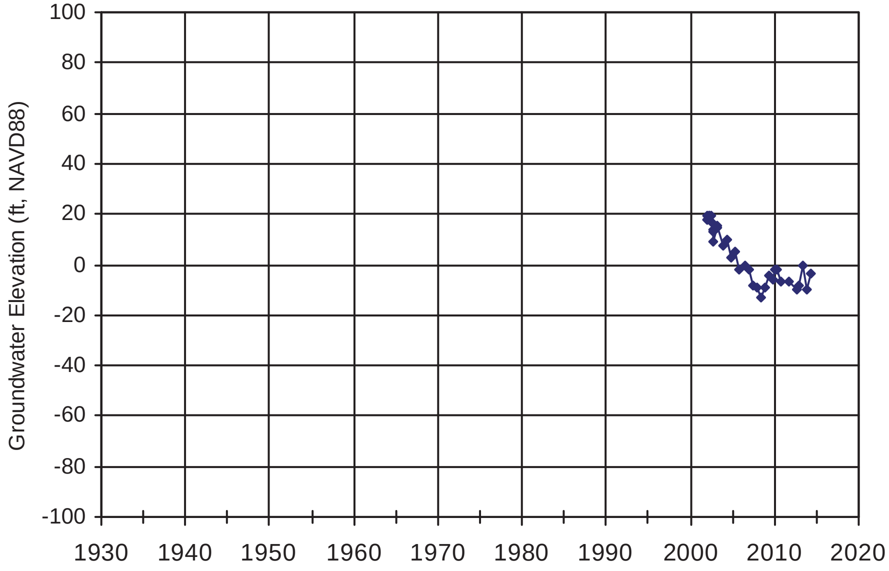
WellID: **RNVWD 2** Source: RNVWD RPE: 170.29 ft, NAVD88
Aquifer Zone: Basal Tehama



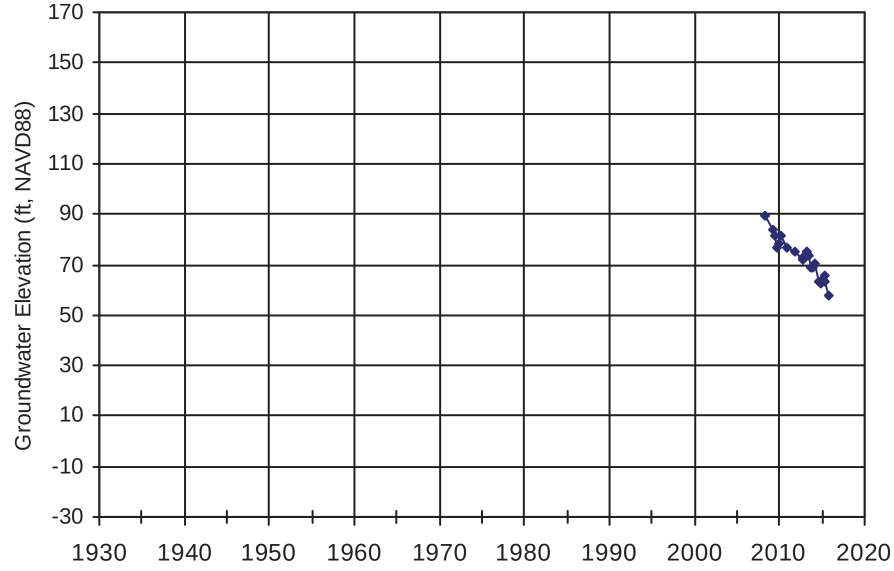

WellID: **RNVWD MW-1389ft** Source: RNVWD RPE: 171.94 ft, NAVD88
Aquifer Zone: Basal Tehama



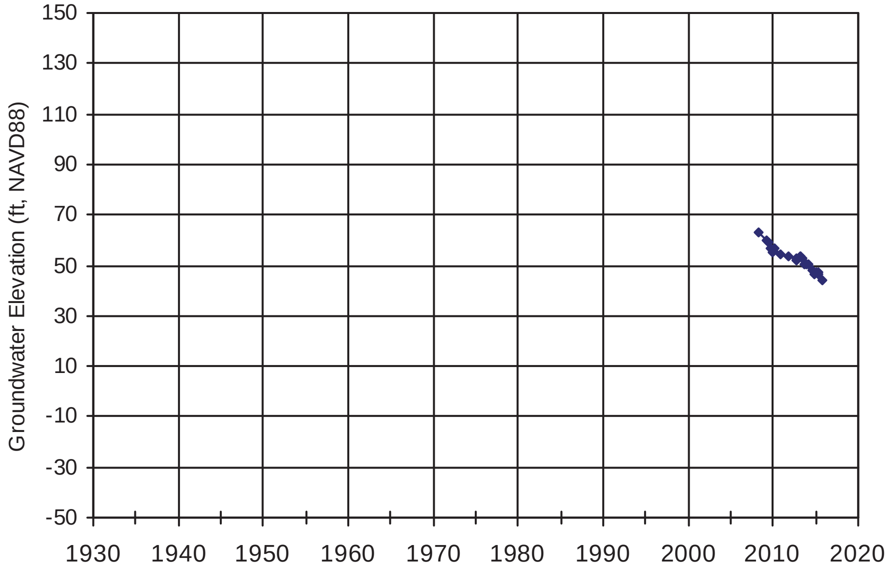

WellID: **RNVWD MW-862ft** Source: RNVWD RPE: 171.78 ft, NAVD88
Aquifer Zone: Basal Tehama



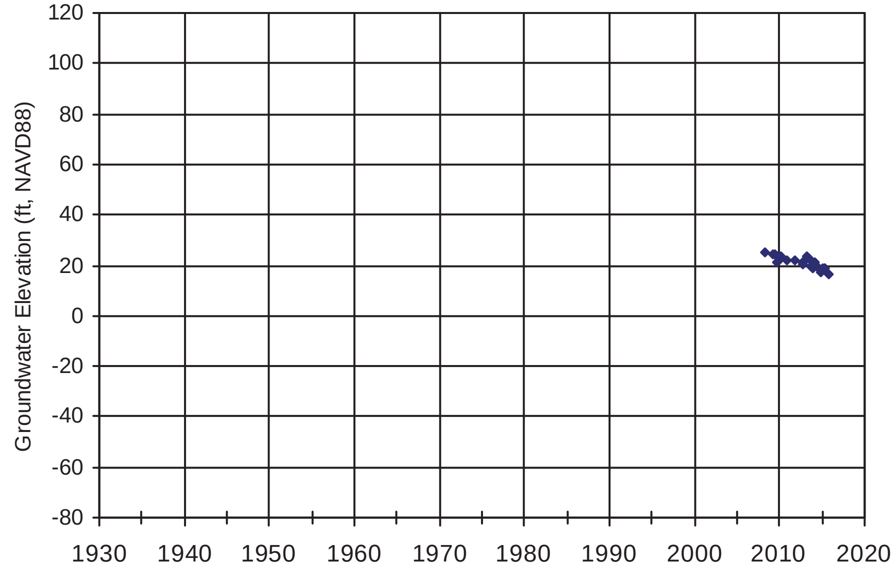

WellID: **SCWA-Allendale MW-1235** Source: SCWA RPE: 132.81 ft, NAVD88
Aquifer Zone: Basal Tehama



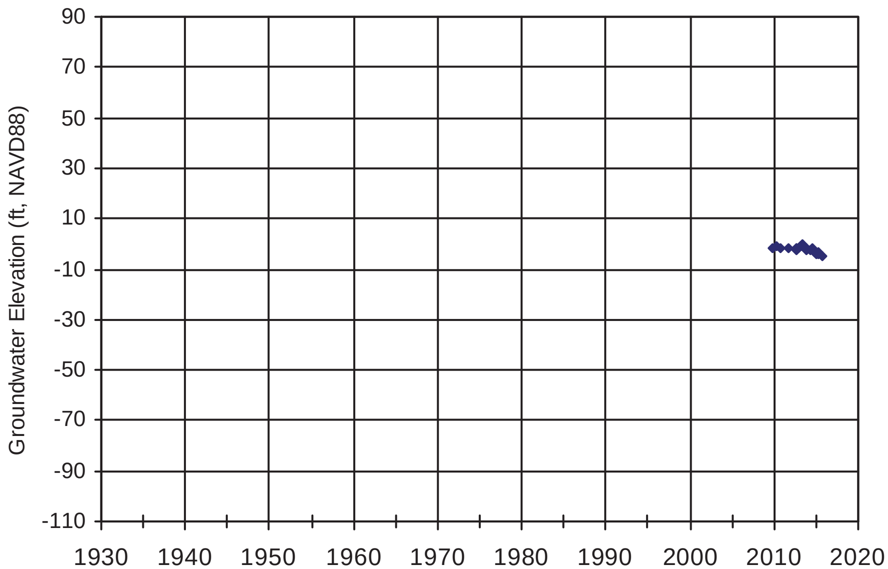
WellID: **SCWA-Allendale MW-1345** Source: SCWA RPE: 132.31 ft, NAVD88
Aquifer Zone: Basal Tehama



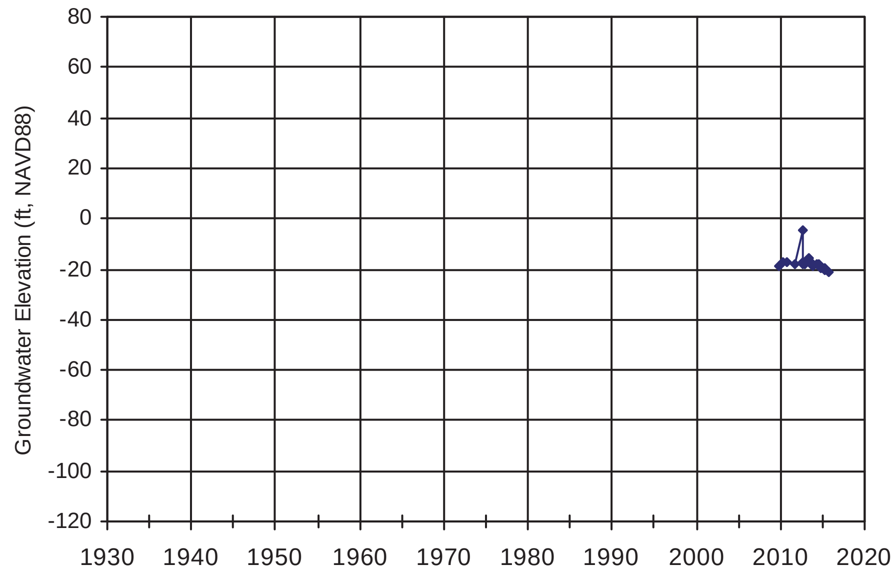

WellID: **SCWA-Allendale MW-1925** Source: SCWA RPE: 131.79 ft, NAVD88
Aquifer Zone: Basal Tehama




WellID: **SCWA-Dixon MW-2212** Source: SCWA RPE: 79.53 ft, NAVD88
Aquifer Zone: Basal Tehama

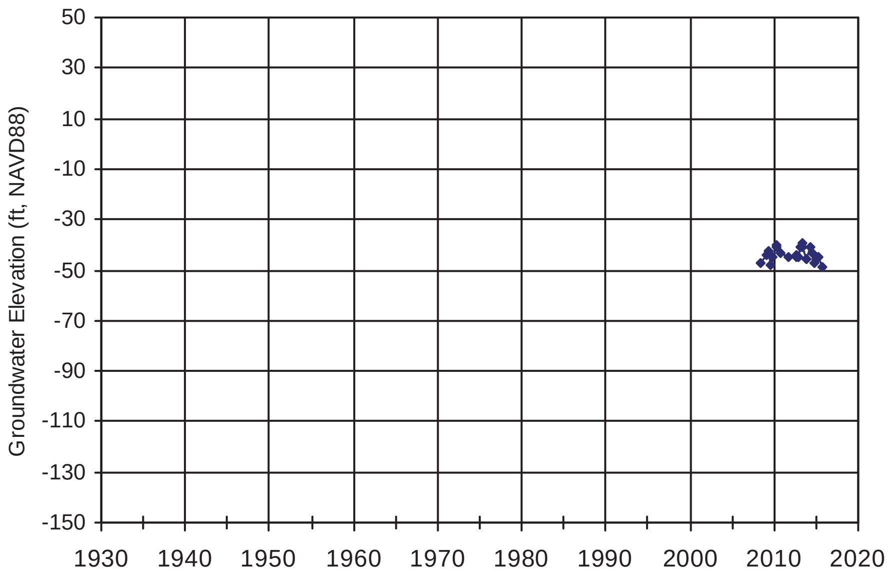



WellID: **SCWA-Dixon MW-2370** Source: SCWA RPE: 79.23 ft, NAVD88
Aquifer Zone: Basal Tehama



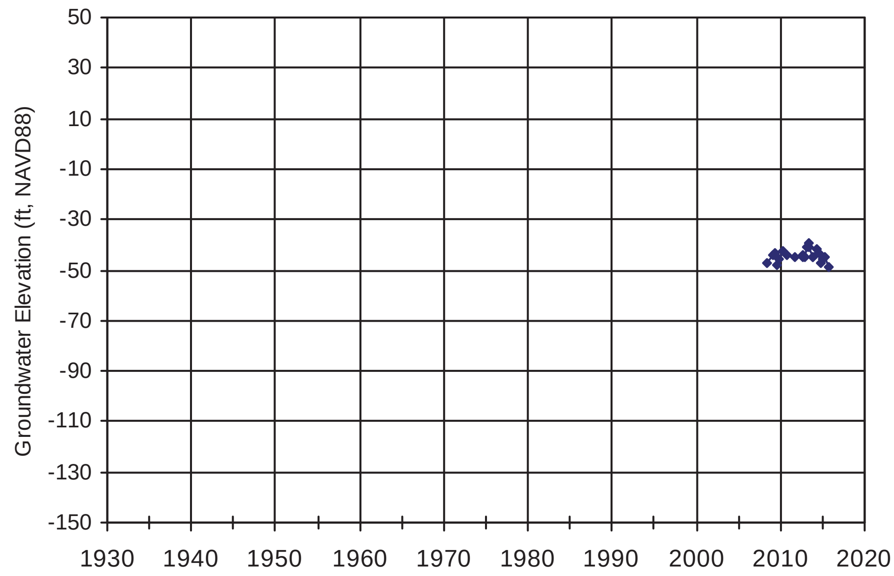
WellID: **SCWA-MainePrairie MW-1960** Source: SCWA RPE: 53.35 ft, NAVD88

Aquifer Zone: Basal Tehama



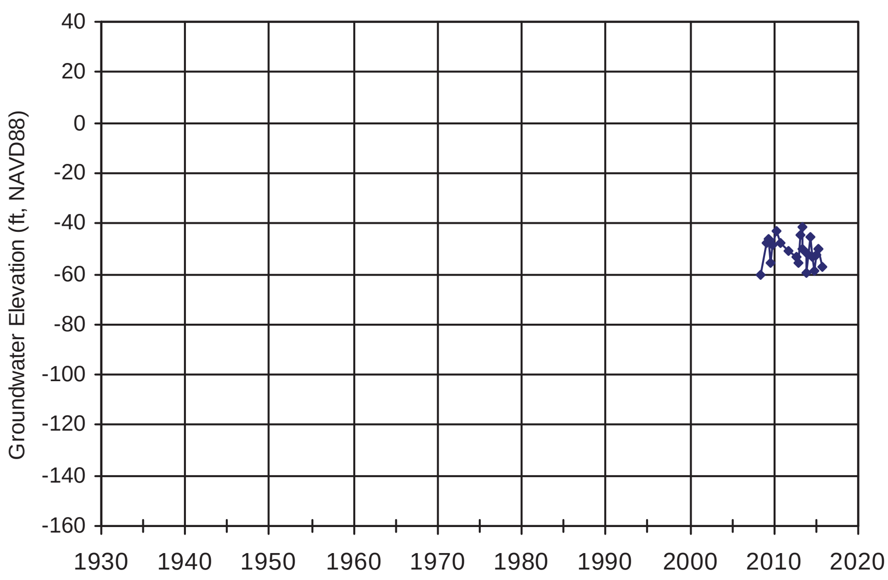

WellID: **SCWA-MainePrairie MW-2170** Source: SCWA RPE: 53.58 ft, NAVD88

Aquifer Zone: Basal Tehama



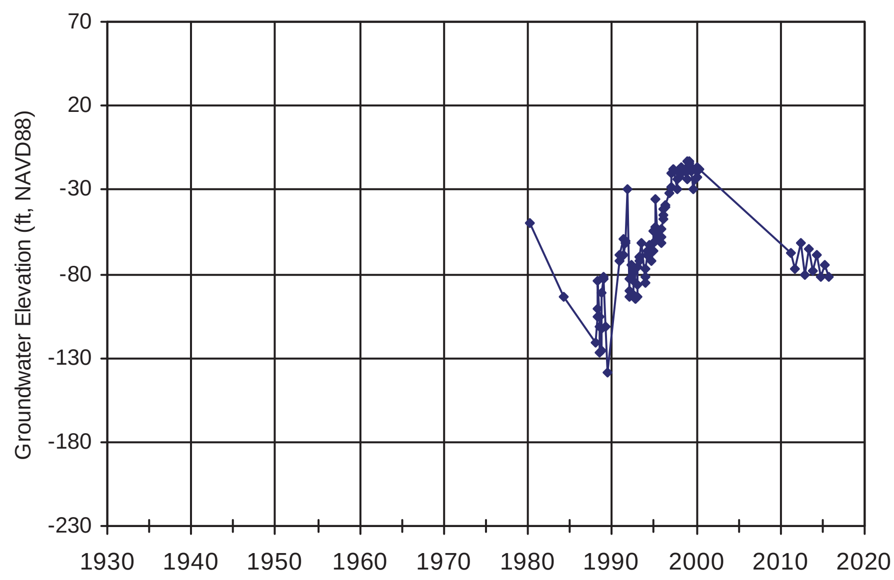

WellID: **SCWA-Meridian MW-1680** Source: SCWA RPE: 77.98 ft, NAVD88

Aquifer Zone: Basal Tehama



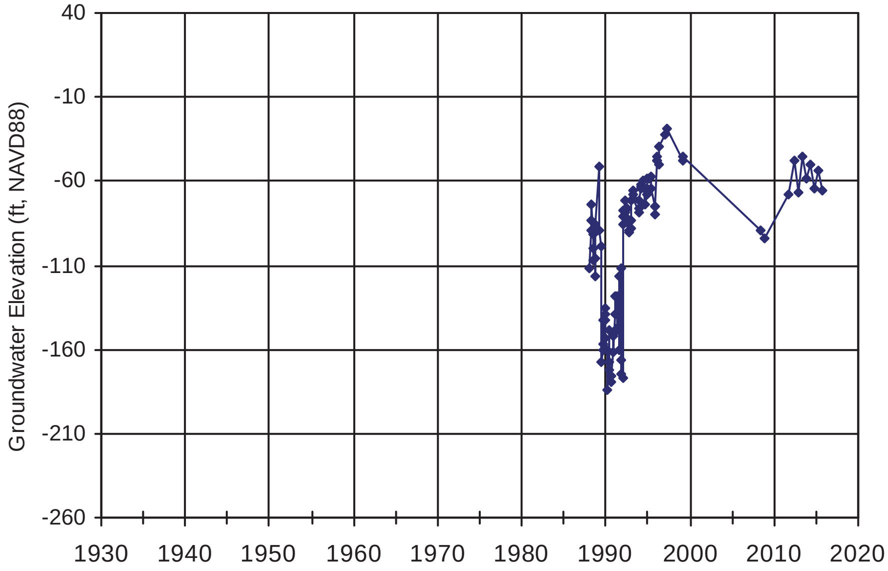

WellID: **Well 02** Source: CofV RPE: 120.78 ft, NAVD88

Aquifer Zone: Basal Tehama



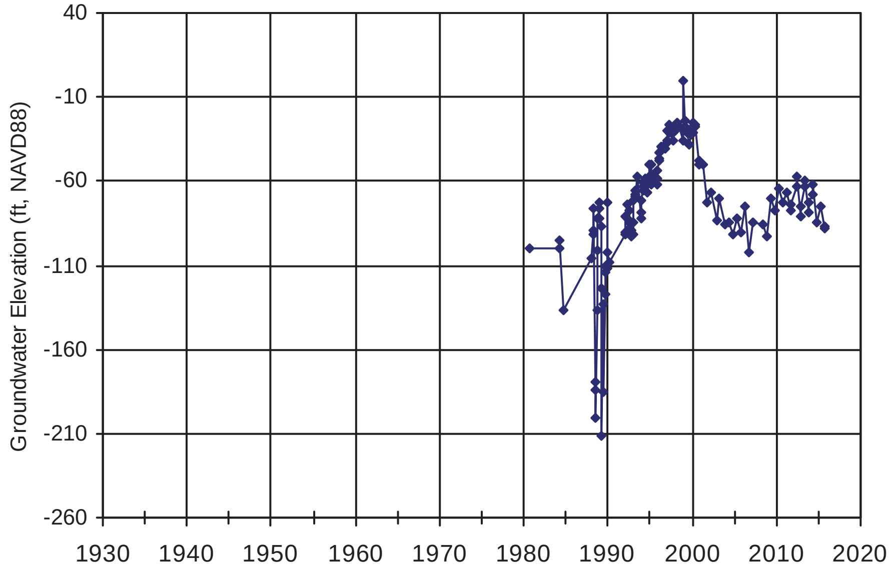
WellID: **Well 03** Source: CofV RPE: 111.04 ft, NAVD88

Aquifer Zone: Basal Tehama



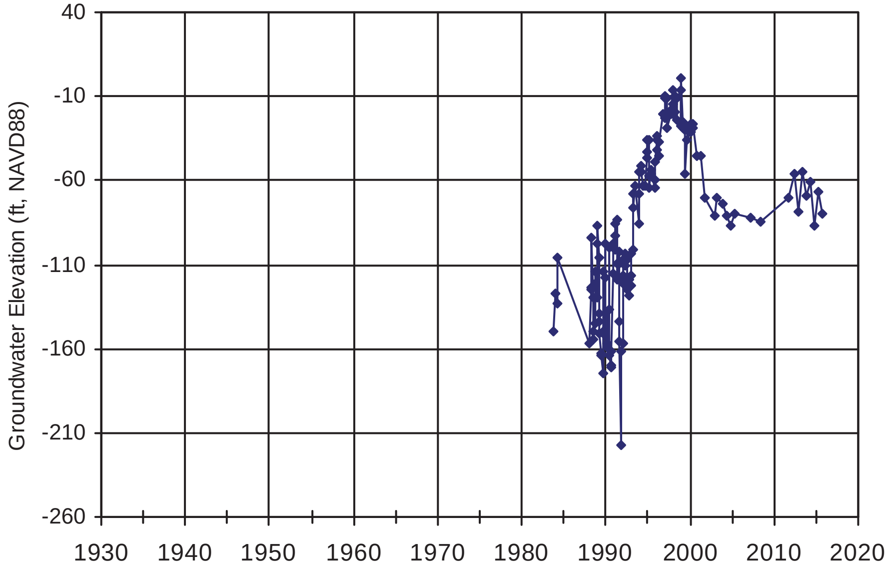

WellID: **Well 05** Source: CofV RPE: 106.34 ft, NAVD88

Aquifer Zone: Basal Tehama



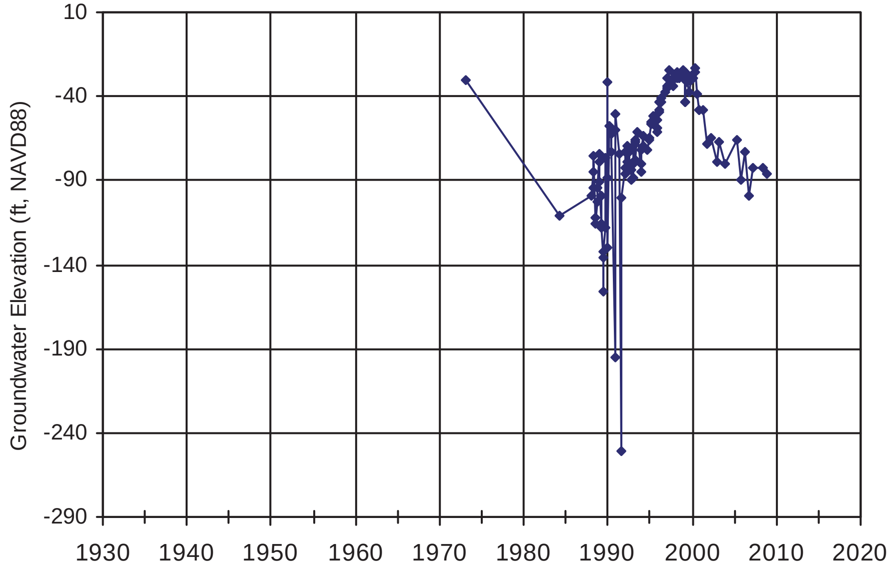

WellID: **Well 06** Source: CofV RPE: 100.67 ft, NAVD88

Aquifer Zone: Basal Tehama



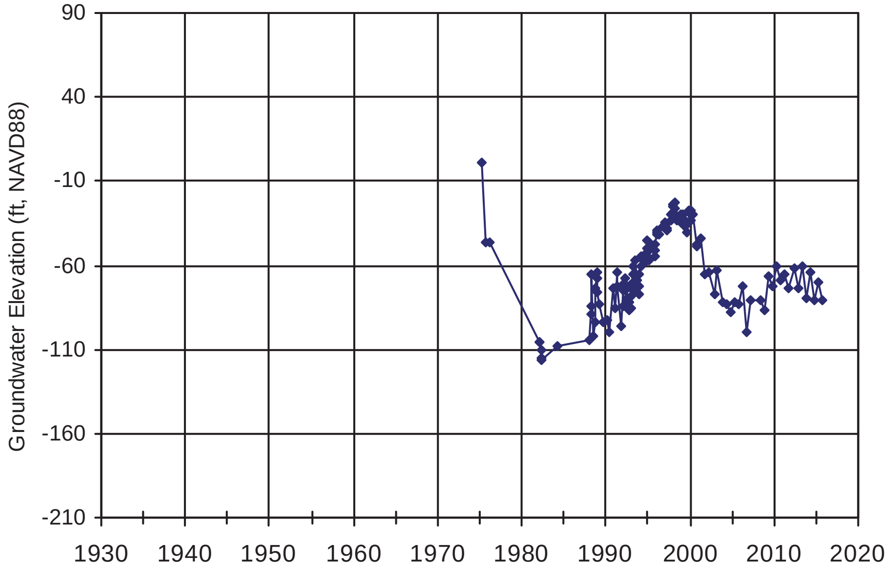

WellID: **Well 07** Source: CofV RPE: 99.41 ft, NAVD88

Aquifer Zone: Basal Tehama



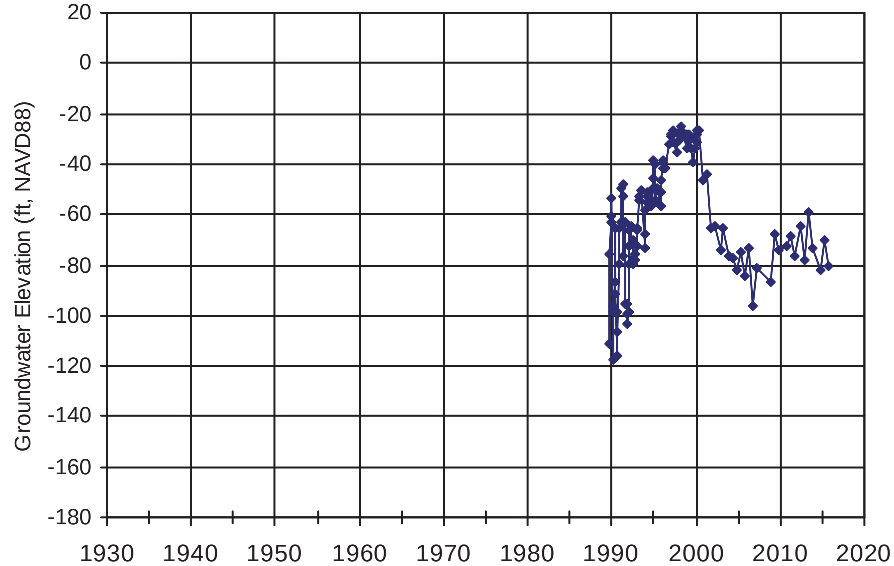
WellID: **Well 08** Source: CofV RPE: 97.83 ft, NAVD88

Aquifer Zone: Basal Tehama



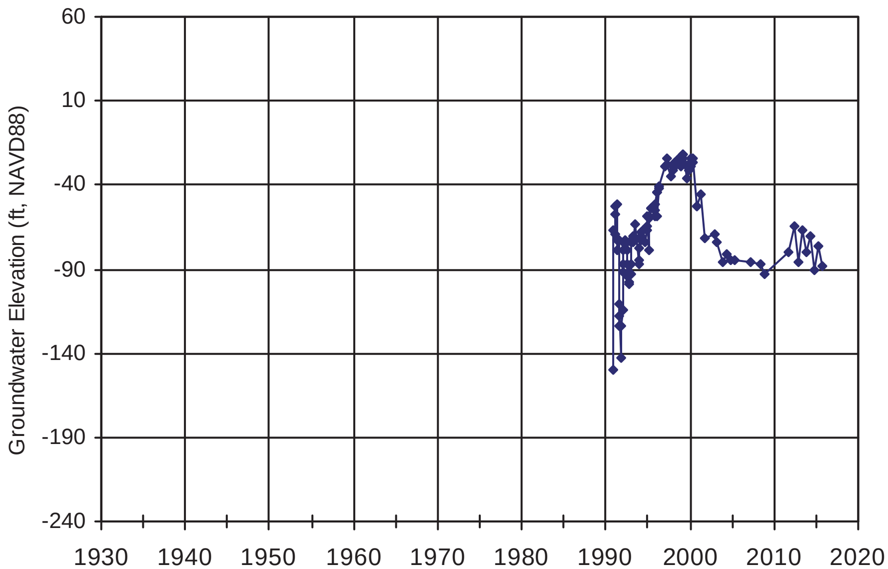

WellID: **Well 09** Source: CofV RPE: 96.64 ft, NAVD88

Aquifer Zone: Basal Tehama



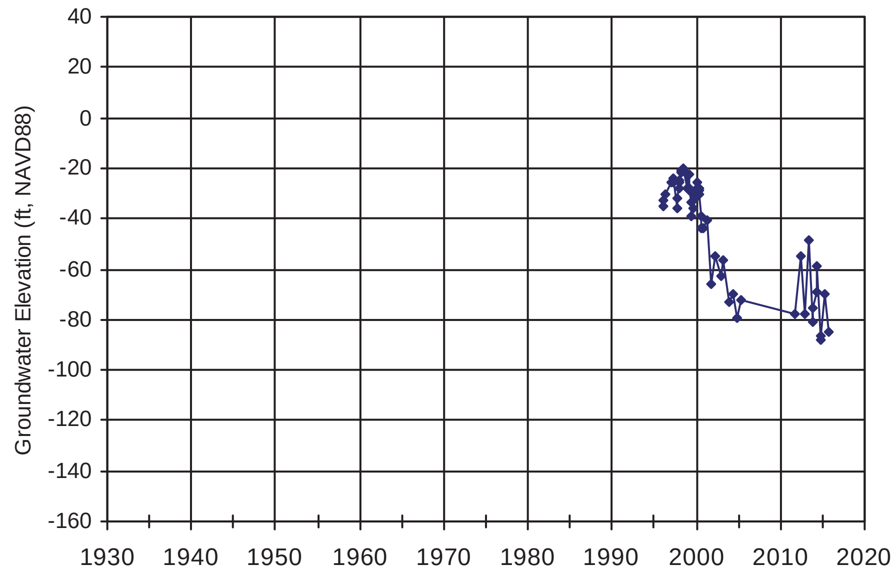

WellID: **Well 13** Source: CofV RPE: 105.66 ft, NAVD88

Aquifer Zone: Basal Tehama



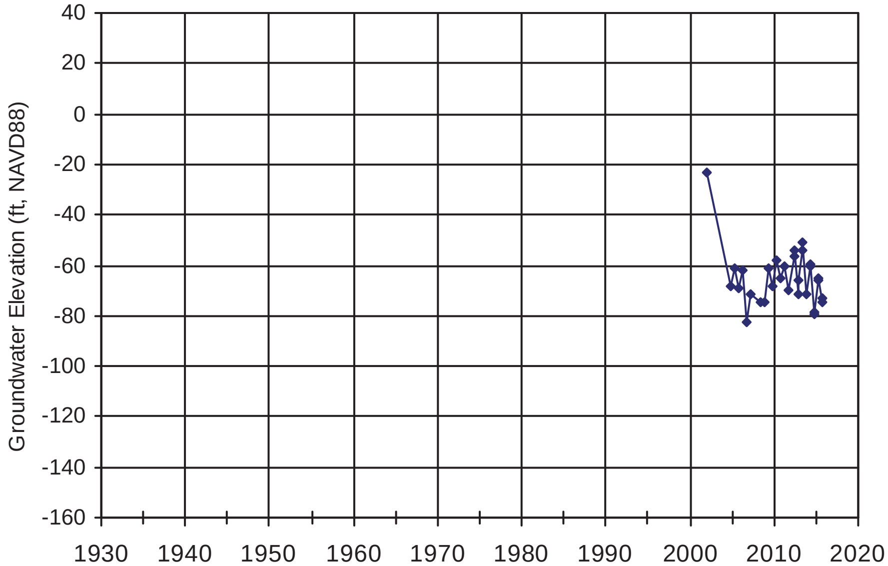

WellID: **Well 14** Source: CofV RPE: 97.27 ft, NAVD88

Aquifer Zone: Basal Tehama



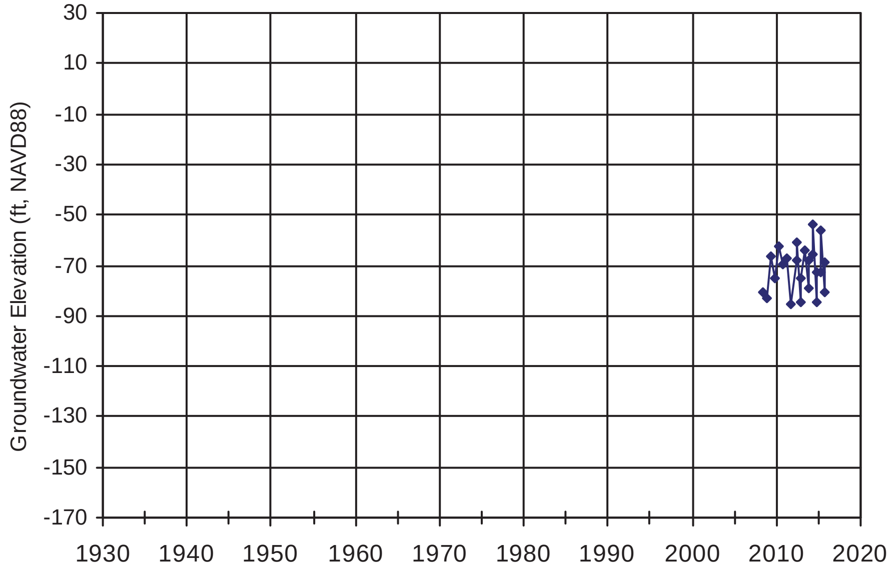
WellID: **Well 15** Source: CofV RPE: 96.75 ft, NAVD88

Aquifer Zone: Basal Tehama



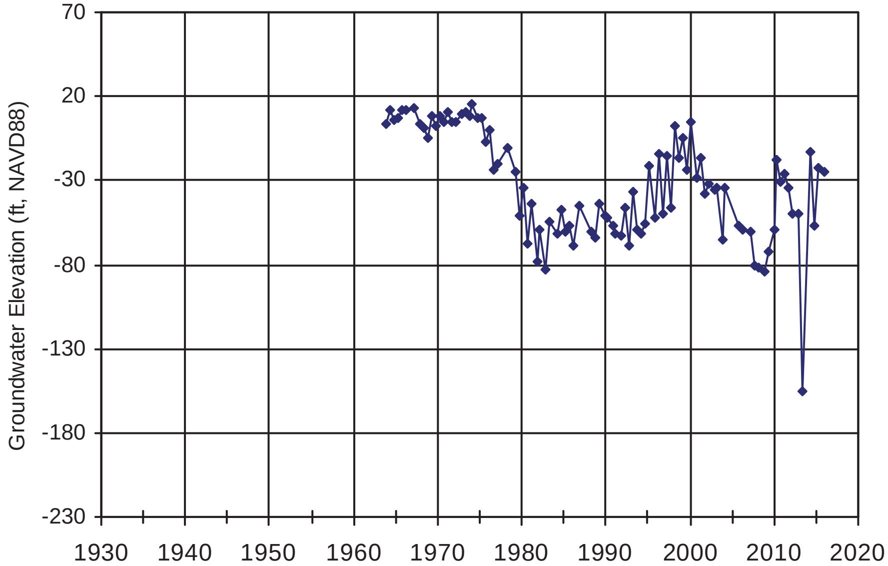

WellID: **Well 16** Source: CofV RPE: 106.2 ft, NAVD88

Aquifer Zone: Basal Tehama



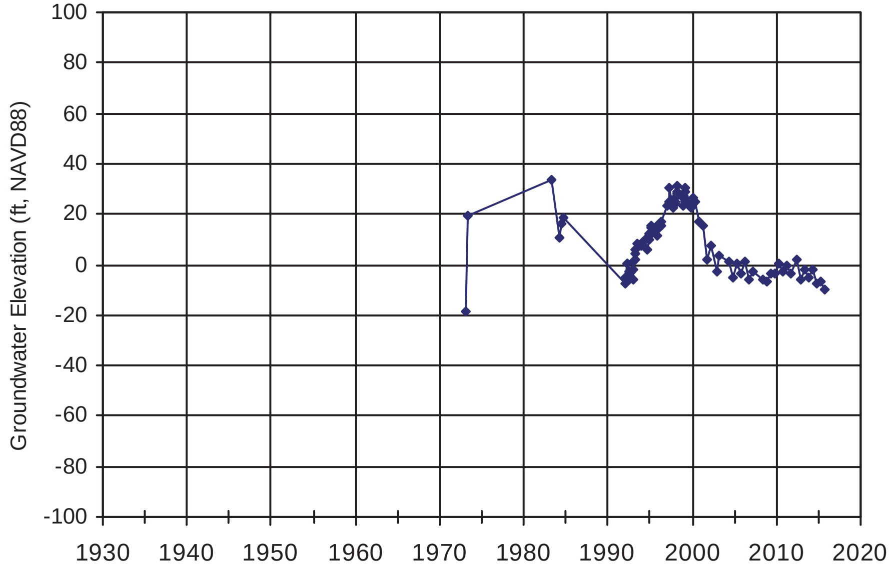

WellID: **06N01W24N002M** Source: DWR RPE: 93.57 ft, NAVD88

Aquifer Zone: Basal Tehama (primary) & Middle Tehama



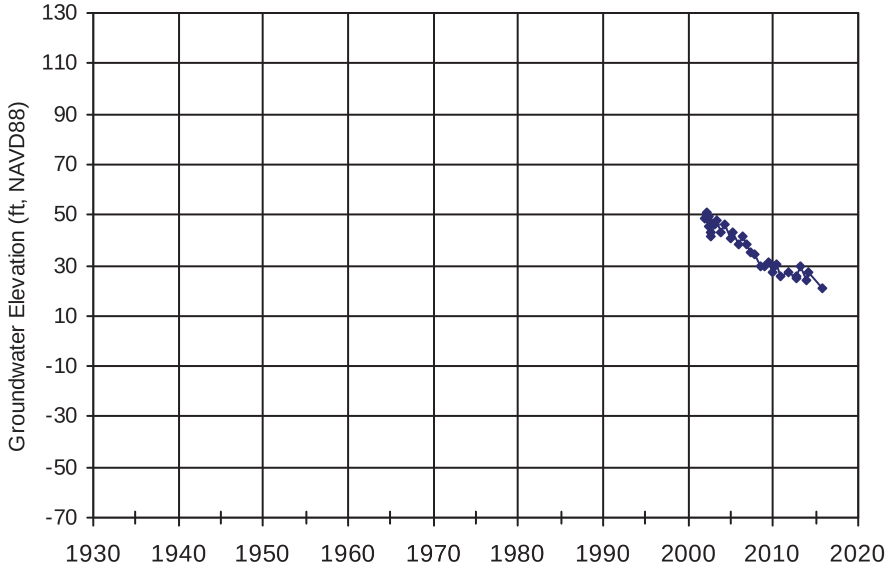

WellID: **Well 01** Source: CofV RPE: 133.23 ft, NAVD88

Aquifer Zone: Markley Formation



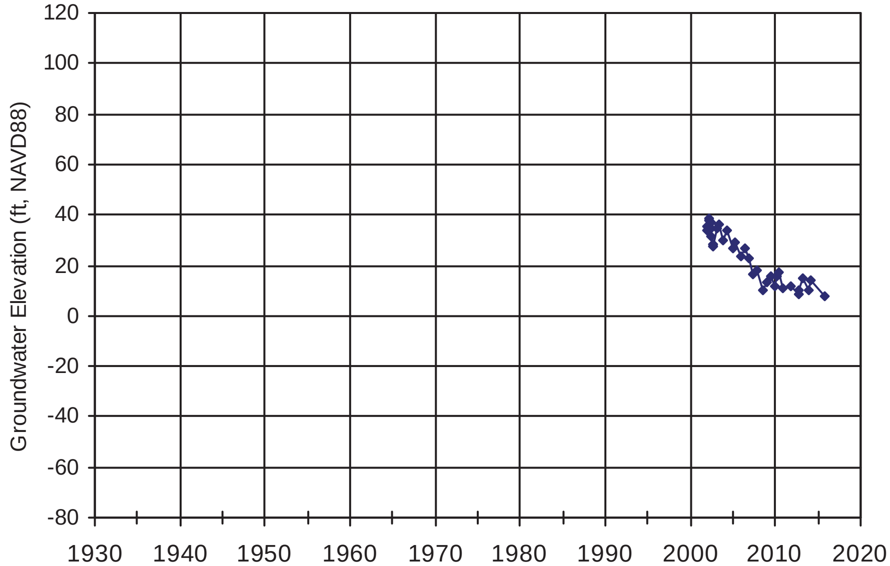
WellID: **RNVWD MW-446ft** Source: RNVWD RPE: 171.78 ft, NAVD88

Aquifer Zone: Middle Tehama



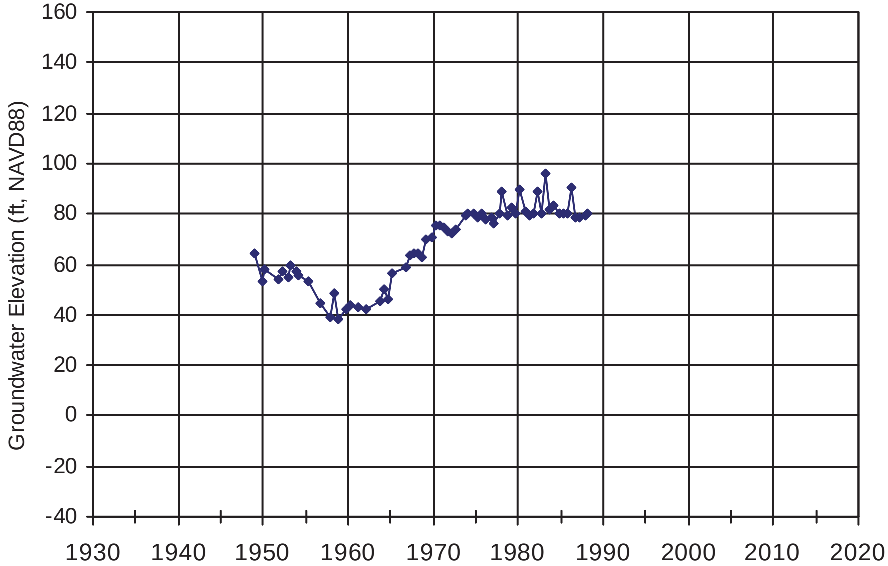

WellID: **RNVWD MW-594ft** Source: RNVWD RPE: 171.78 ft, NAVD88

Aquifer Zone: Middle Tehama



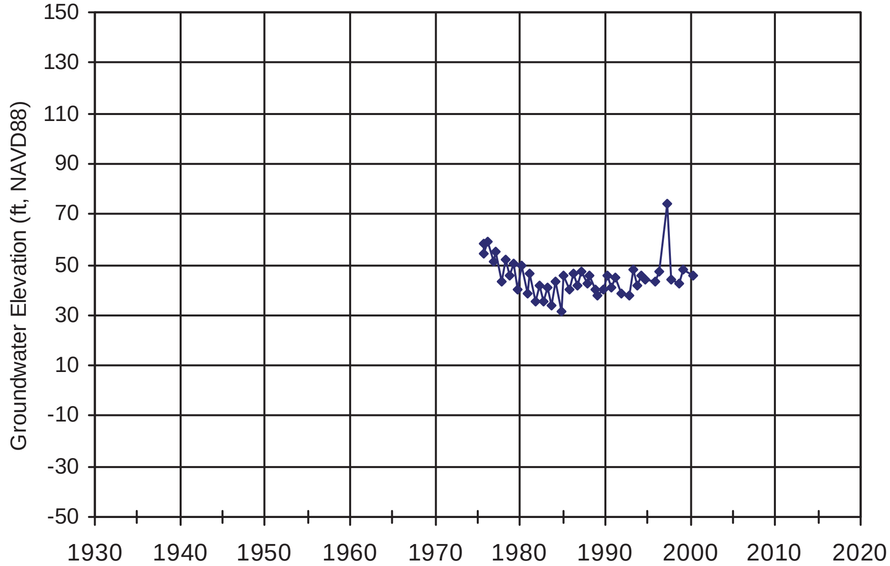

WellID: **06N01W23C001M** Source: DWR RPE: 103.6 ft, NAVD88

Aquifer Zone: Middle Tehama

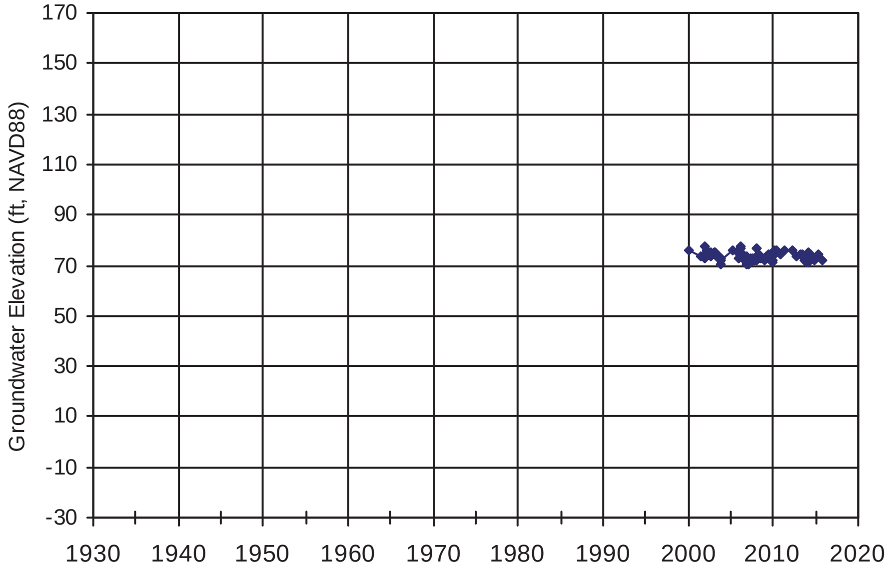



WellID: **07N01W34F001M** Source: DWR RPE: 143.3 ft, NAVD88

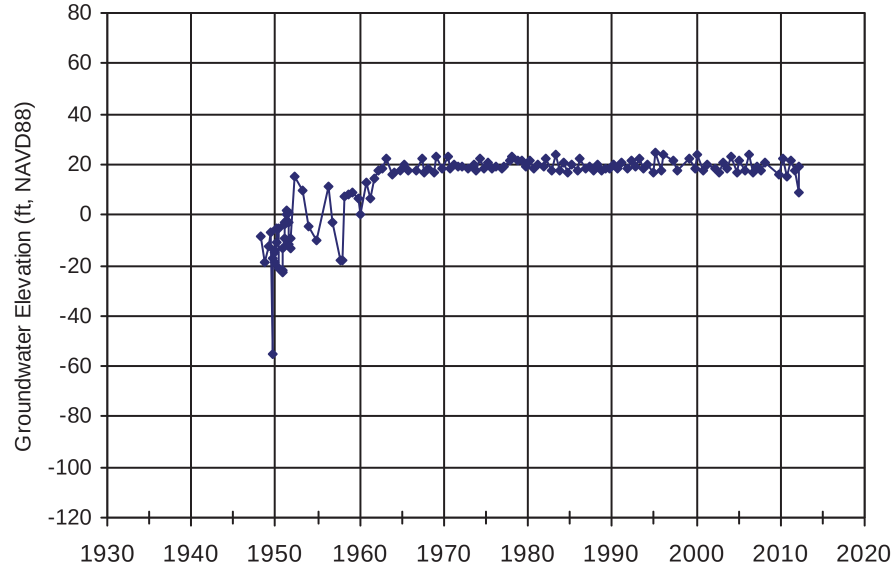
Aquifer Zone: Middle Tehama



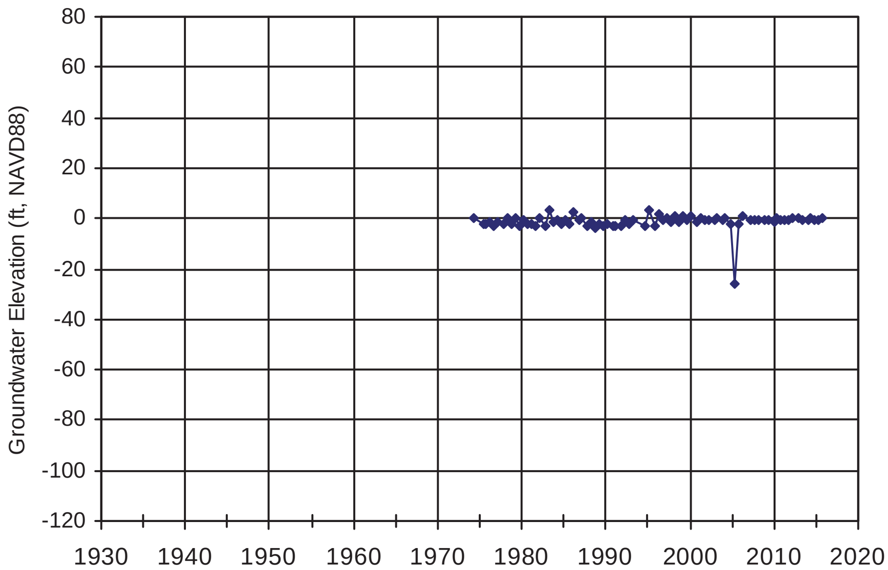
WellID: **DeMello MW-95ft** Source: CofV RPE: 79.78 ft, NAVD88
Aquifer Zone: Quaternary Alluvium



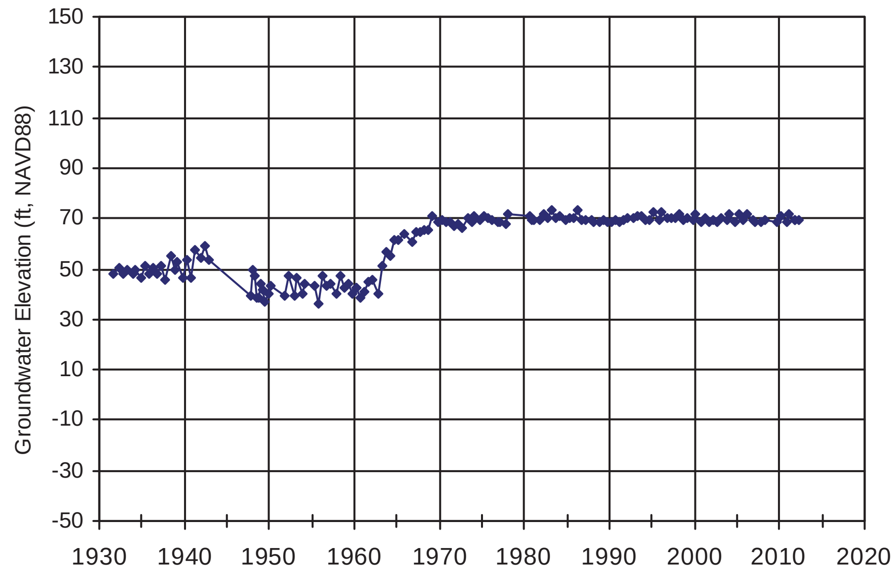

WellID: **04N02W04D002M** Source: DWR RPE: 29.11 ft, NAVD88
Aquifer Zone: Quaternary Alluvium



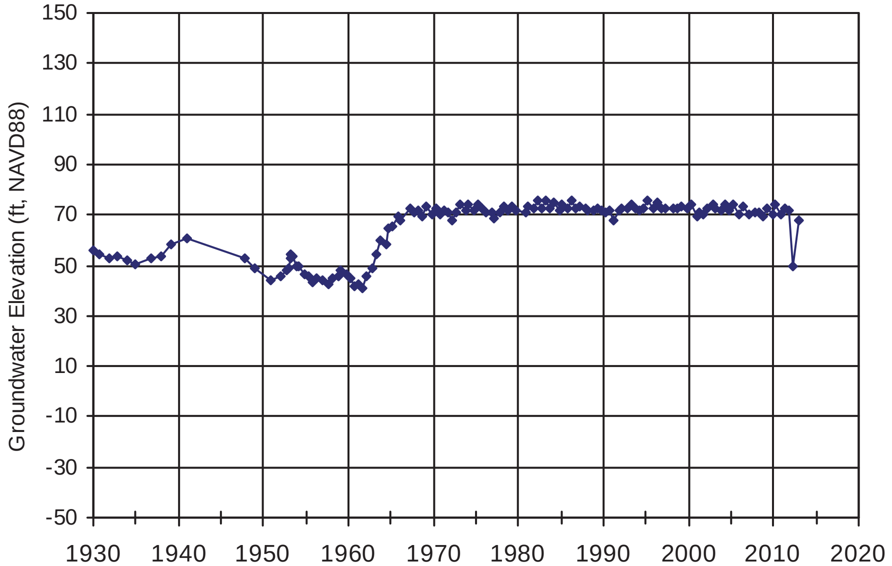

WellID: **05N02E25K001M** Source: DWR RPE: 3.55 ft, NAVD88
Aquifer Zone: Quaternary Alluvium



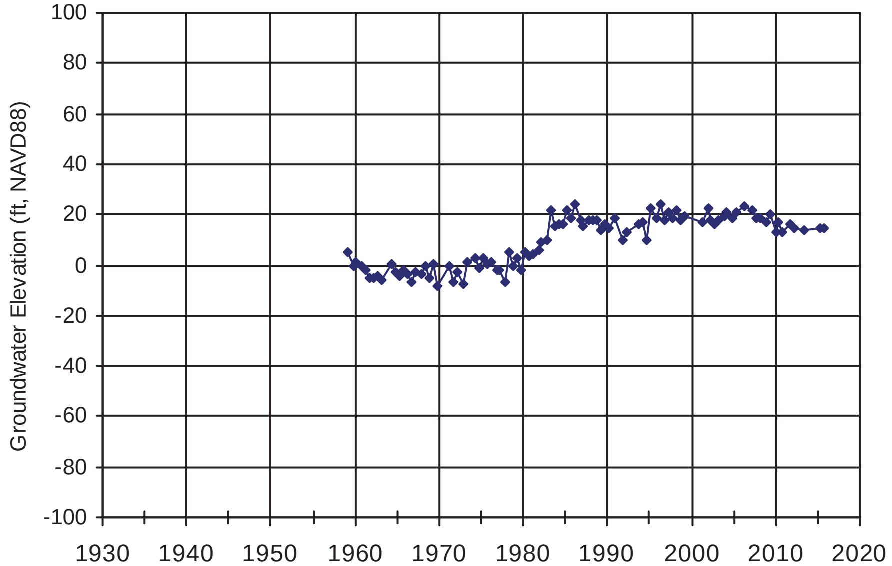

WellID: **06N01E06D001M** Source: DWR RPE: 80.29 ft, NAVD88
Aquifer Zone: Quaternary Alluvium



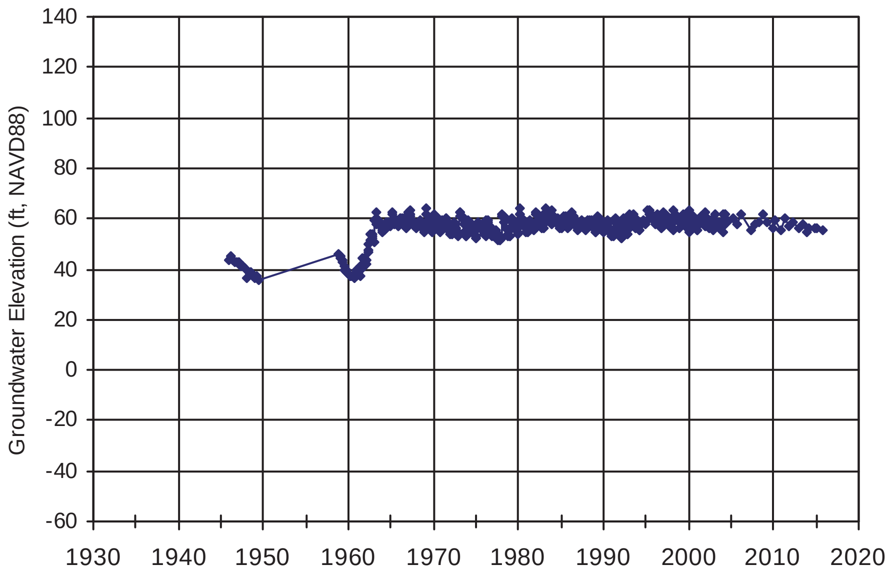
WellID: **06N01W13R001M** Source: DWR RPE: 77.57 ft, NAVD88
Aquifer Zone: Quaternary Alluvium



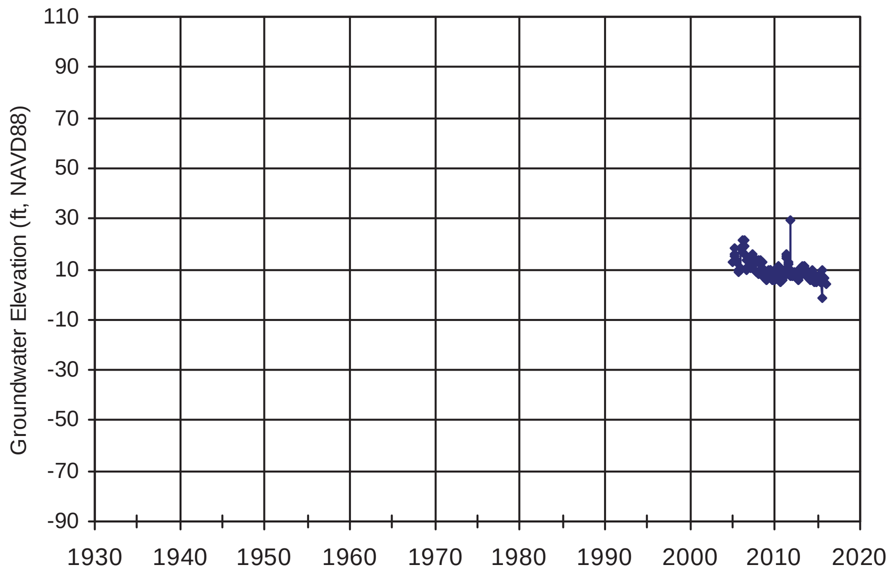

WellID: **06N02E02M003M** Source: DWR RPE: 27.52 ft, NAVD88
Aquifer Zone: Quaternary Alluvium




WellID: **07N01E33R001M** Source: DWR RPE: 65.38 ft, NAVD88
Aquifer Zone: Quaternary Alluvium

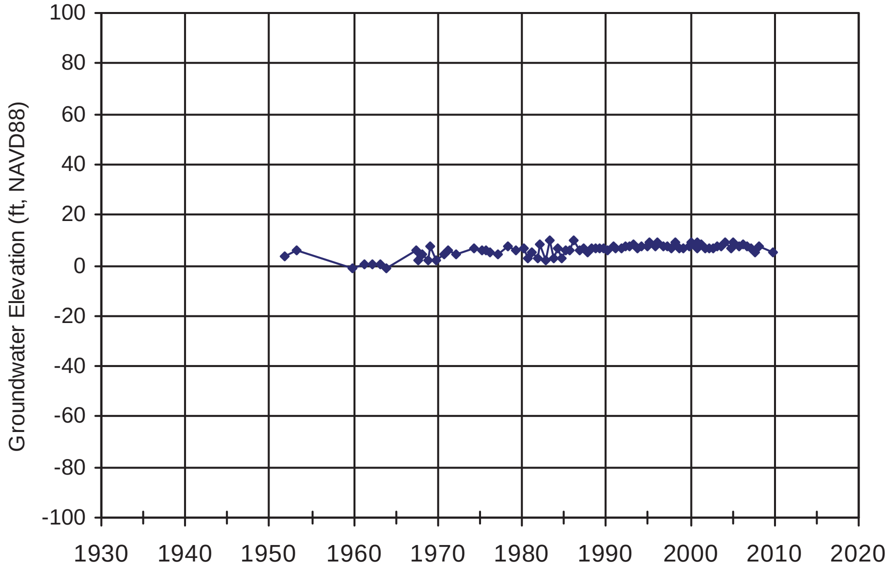



WellID: **07N02E35D001M** Source: DWR RPE: 34.35 ft, NAVD88
Aquifer Zone: Quaternary Alluvium



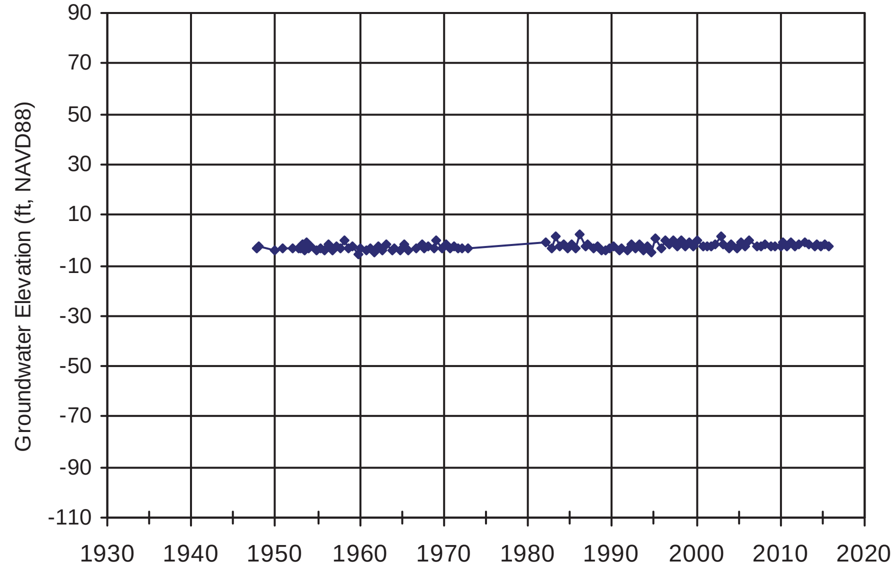
WellID: **05N02E07R001M** Source: DWR RPE: 19.8 ft, NAVD88

Aquifer Zone: Quaternary Alluvium (possible)



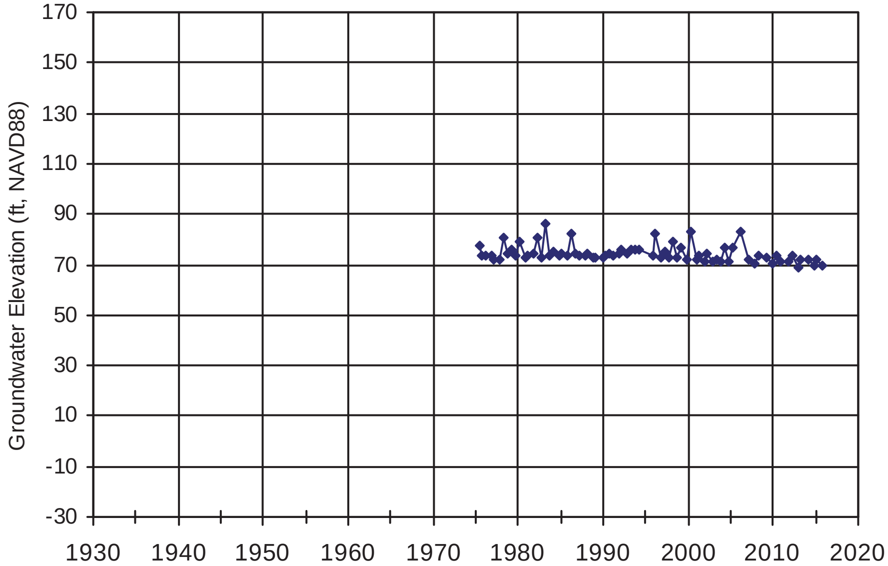

WellID: **05N02E36N001M** Source: DWR RPE: 3.65 ft, NAVD88

Aquifer Zone: Quaternary Alluvium (possible)



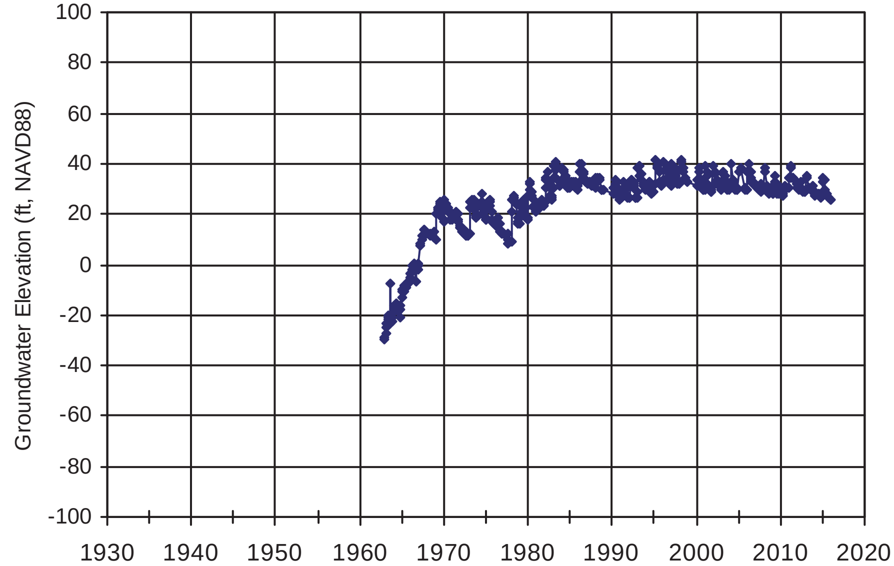

WellID: **05N02W19H004M** Source: DWR RPE: 89.93 ft, NAVD88

Aquifer Zone: Quaternary Alluvium (possible)

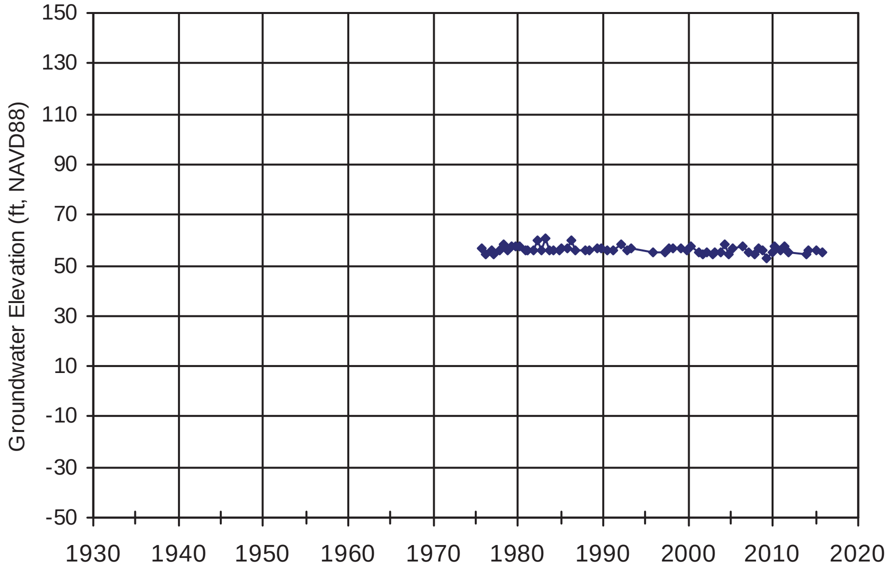



WellID: **06N01E12M001M** Source: DWR RPE: 42.55 ft, NAVD88

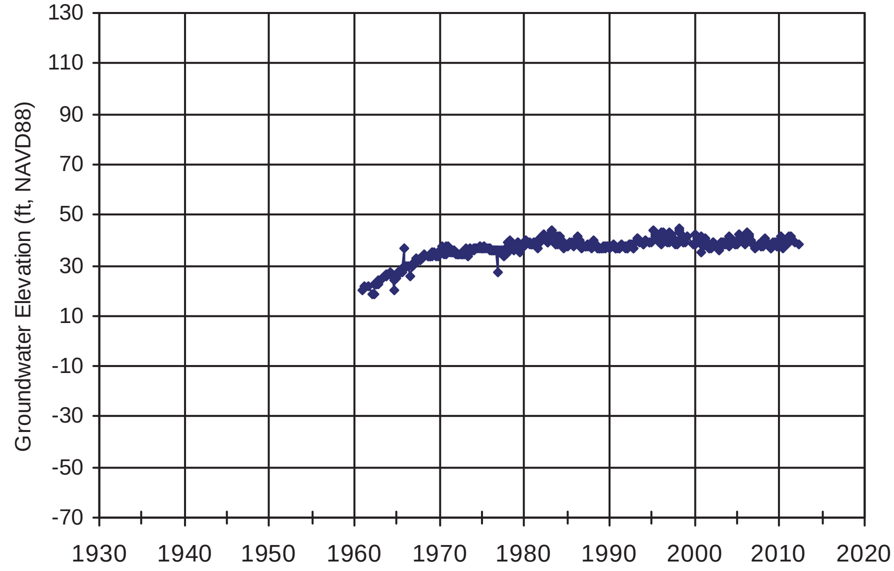
Aquifer Zone: Quaternary Alluvium (possible)



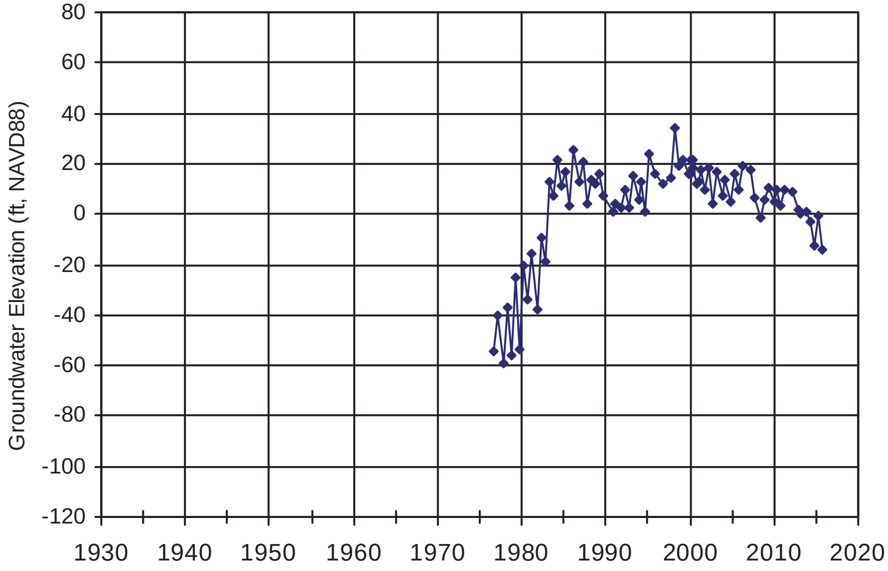
WellID: **06N01E17M001M** Source: DWR RPE: 66.27 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (possible)



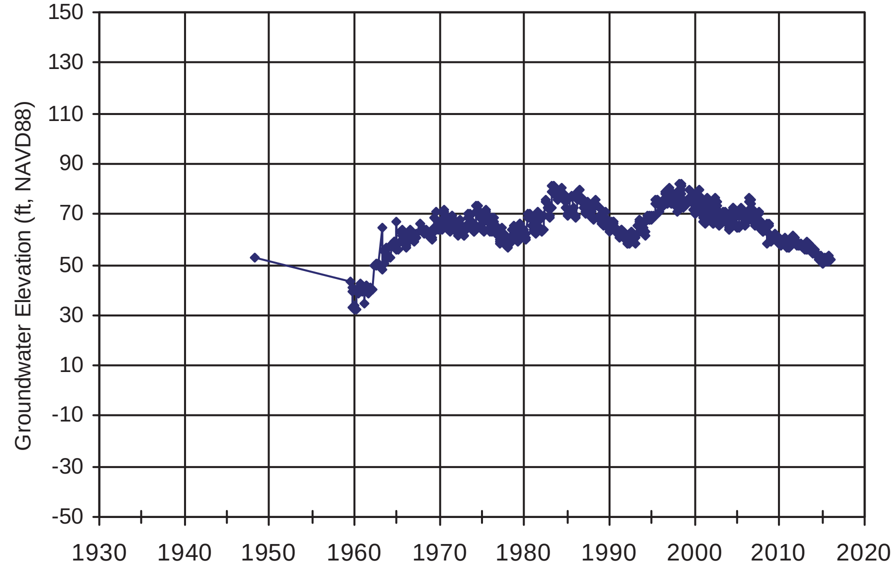

WellID: **06N01E33L001M** Source: DWR RPE: 47.54 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (possible)



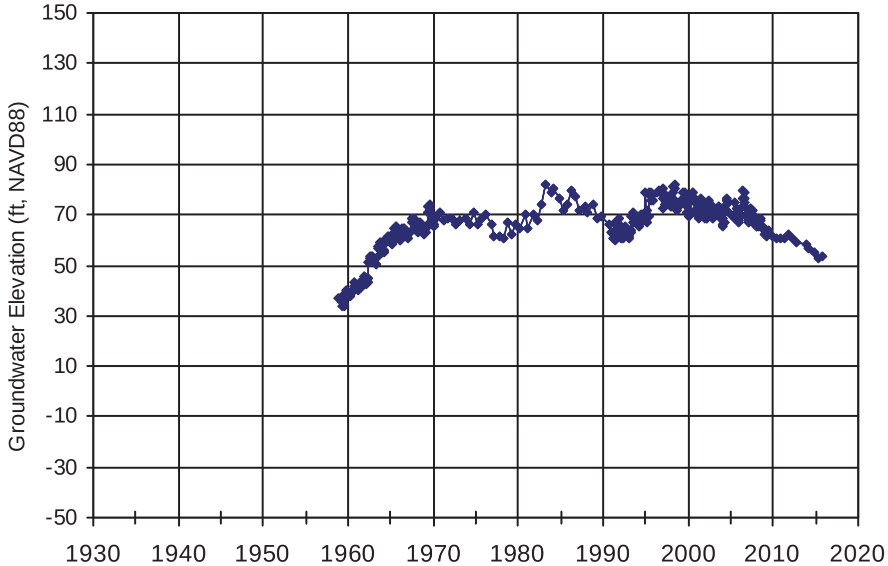

WellID: **07N02E15E001M** Source: DWR RPE: 44.54 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (possible)



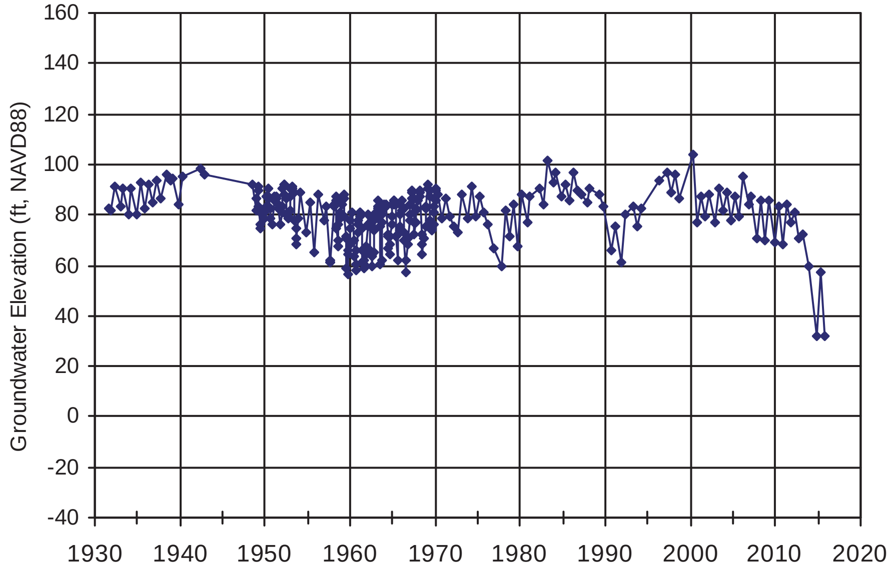

WellID: **08N01E33Q002M** Source: DWR RPE: 89.07 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (possible)



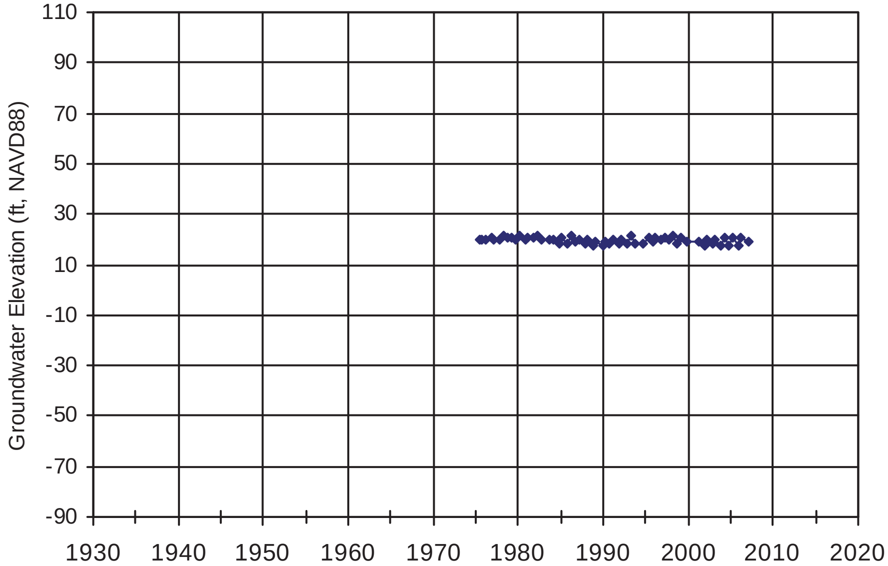
WellID: **08N01E33Q003M** Source: DWR RPE: 88.57 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (possible)



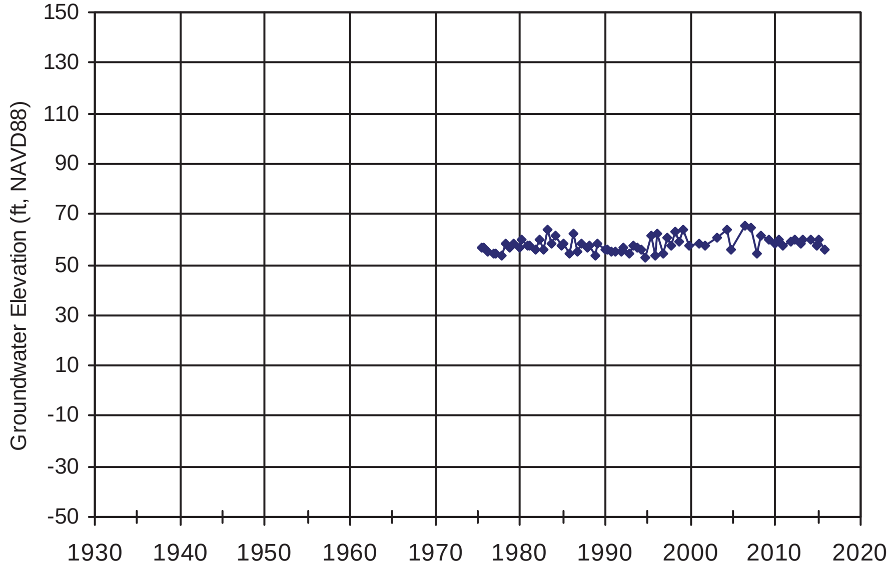

WellID: **08N01W22P001M** Source: DWR RPE: 132.3 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (possible)



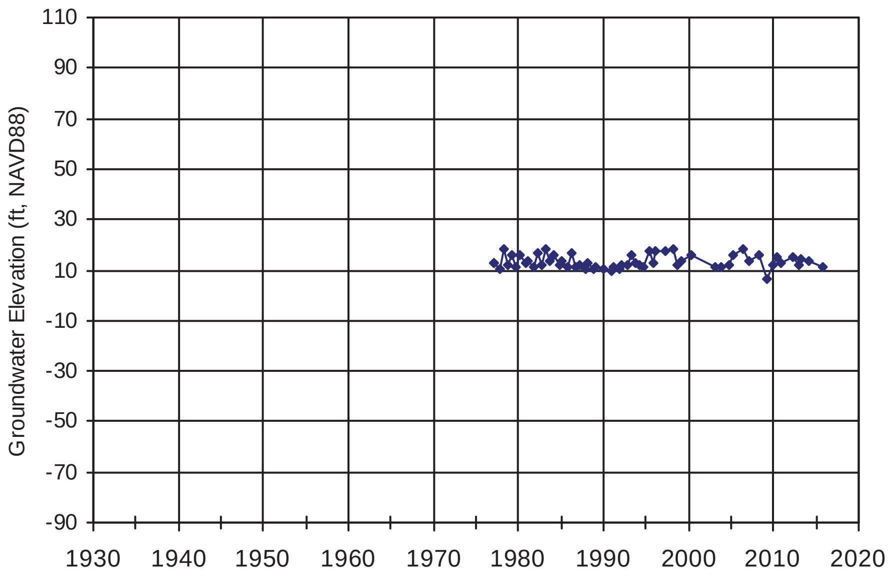

WellID: **04N02W04F003M** Source: DWR RPE: 22.6 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & undifferentiated Cretaceous Rock (possible)



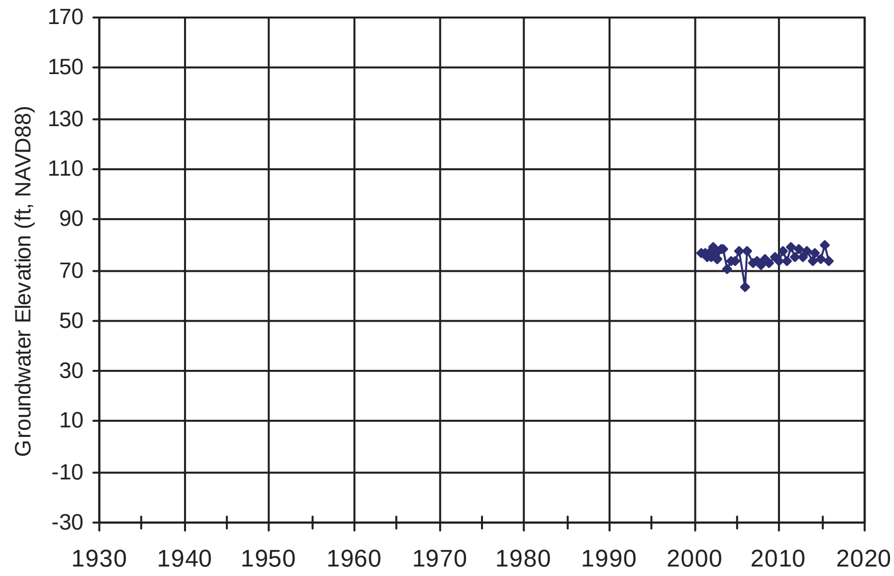

WellID: **05N01W15D001M** Source: DWR RPE: 73.57 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & undifferentiated Cretaceous Rock (possible)



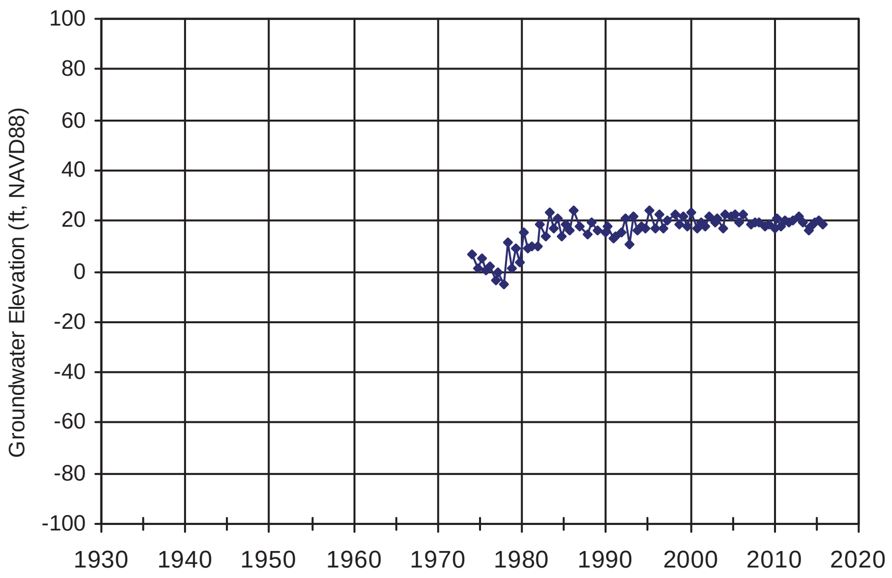
WellID: **05N01W35E001M** Source: DWR RPE: 21.86 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & undifferentiated Cretaceous Rock (possible)



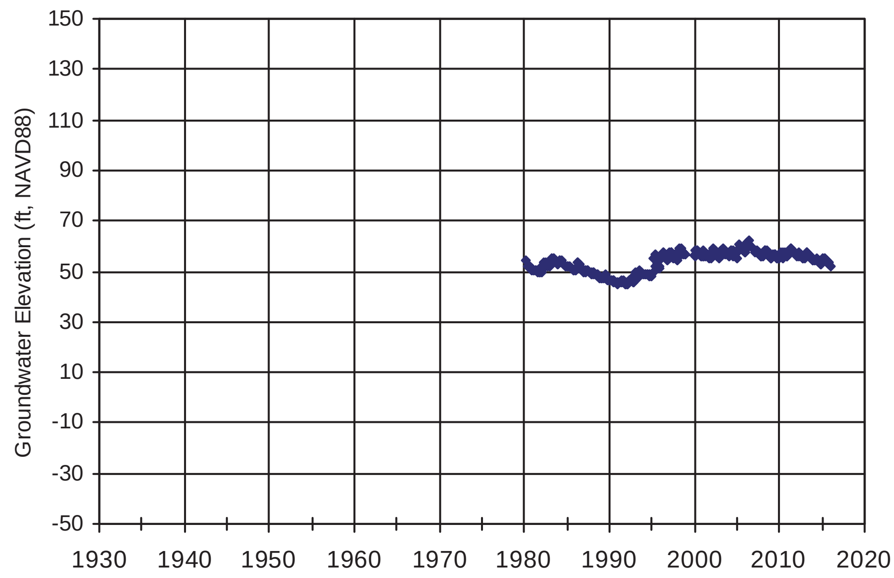

WellID: **MW-15-188ft** Source: CofV RPE: 95.4 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & Upper Tehama



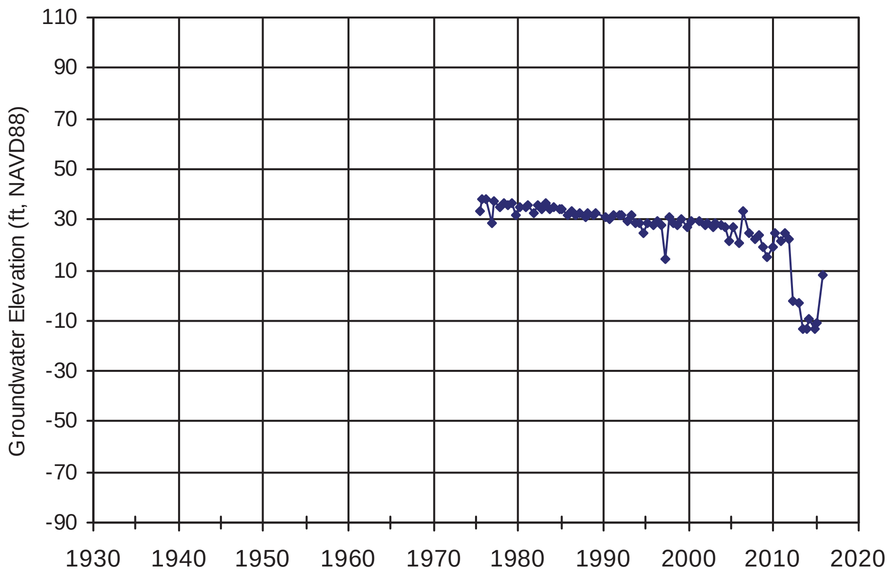

WellID: **06N02E19J001M** Source: DWR RPE: 26.02 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & Upper Tehama



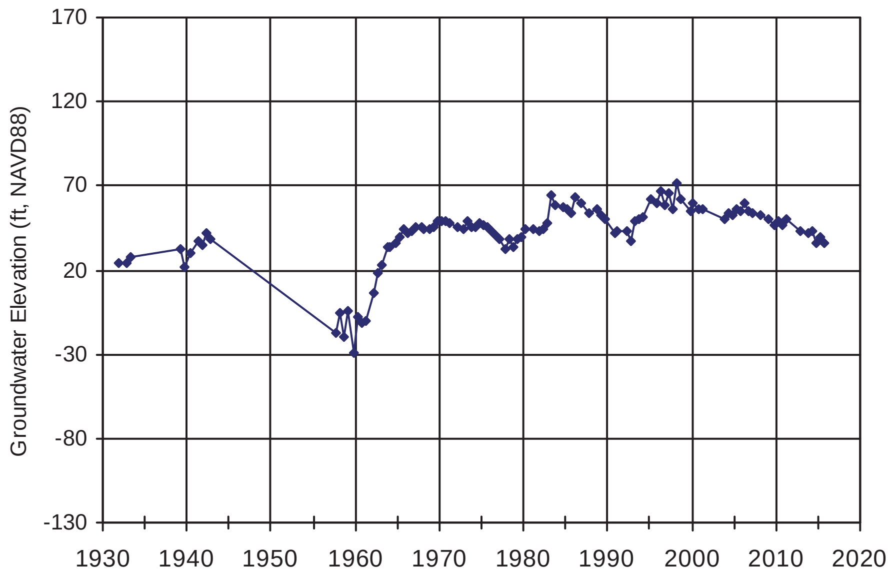

WellID: **04N01E02E001M** Source: DWR RPE: 62.52 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & Upper Tehama (possible)



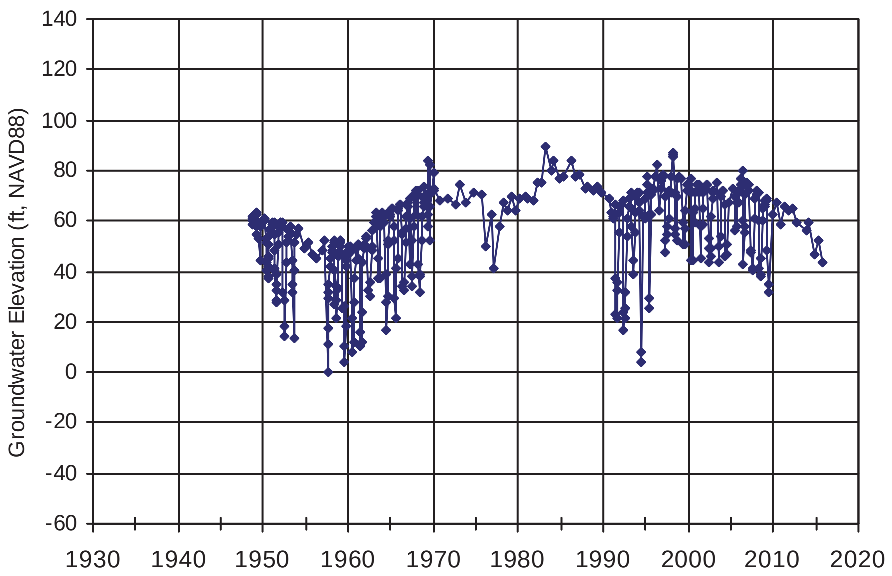
WellID: **04N02E22P001M** Source: DWR RPE: 72.87 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & Upper Tehama (possible)



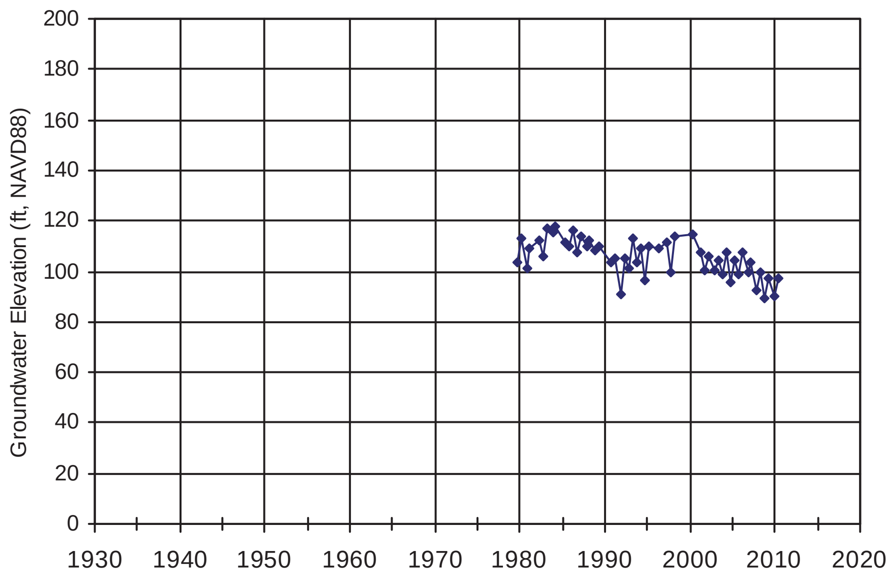

WellID: **07N01E11M001M** Source: DWR RPE: 78.1 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & Upper Tehama (possible)



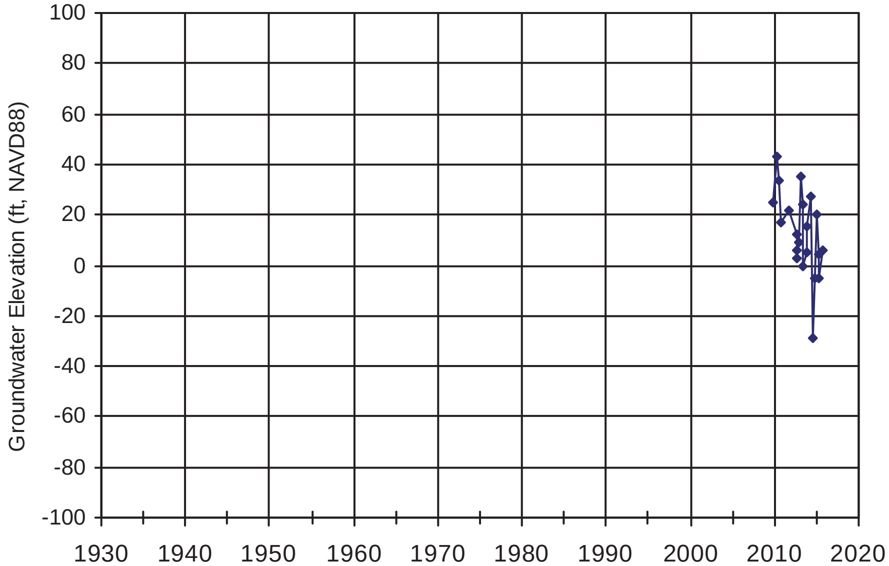

WellID: **08N01E32E001M** Source: DWR RPE: 102.88 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & Upper Tehama (possible)



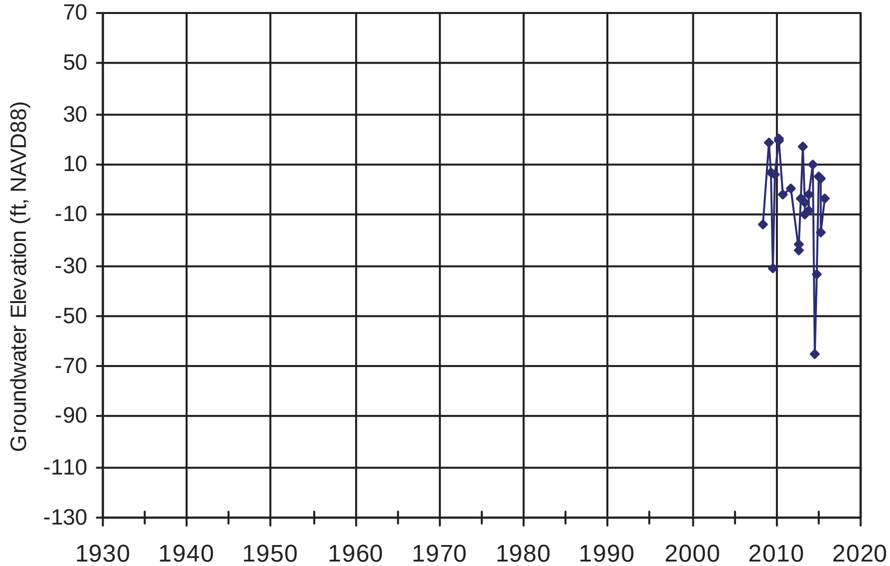

WellID: **08N01W32N003M** Source: DWR RPE: 184.6 ft, NAVD88
Aquifer Zone: Quaternary Alluvium (primary) & Upper Tehama (possible)



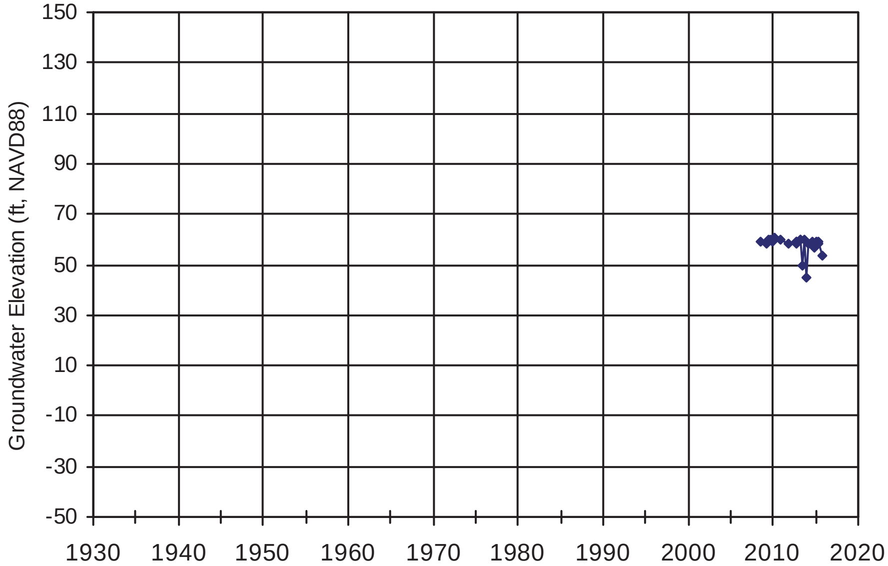
WellID: **SCWA-Dixon MW-1200** Source: SCWA RPE: 79.23 ft, NAVD88
Aquifer Zone: Tehama (general)



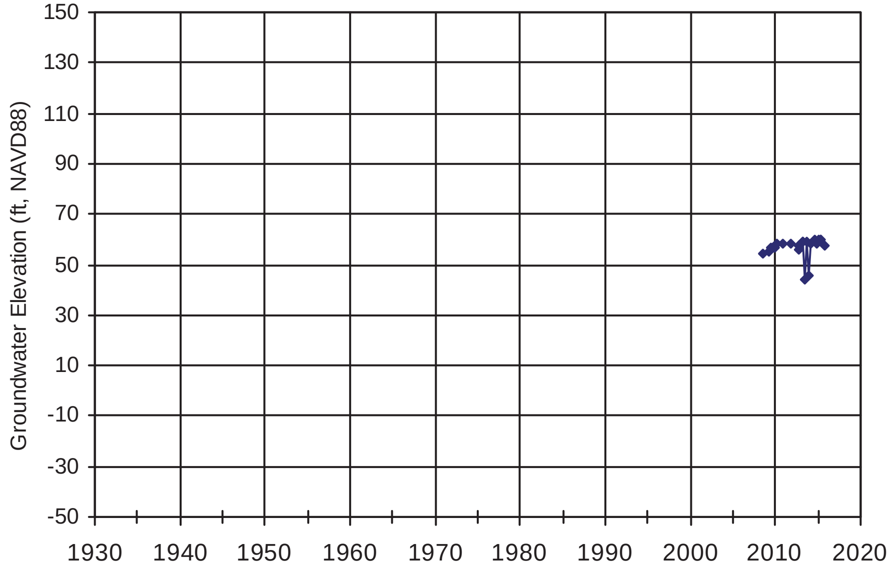

WellID: **SCWA-MainePrairie MW-840** Source: SCWA RPE: 52.76 ft, NAVD88
Aquifer Zone: Tehama (general)



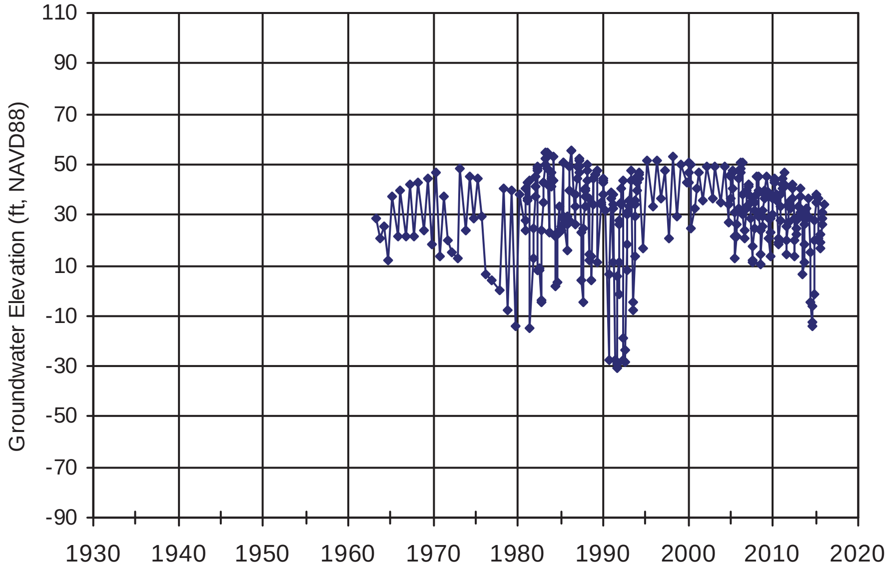

WellID: **SCWA-Meridian MW-400** Source: SCWA RPE: 77.27 ft, NAVD88
Aquifer Zone: Tehama (general)



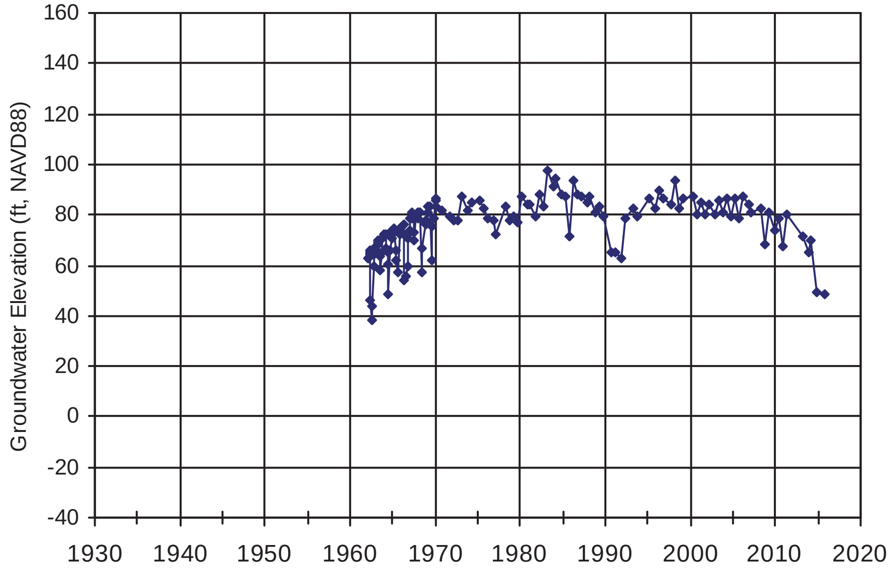

WellID: **SCWA-Meridian MW-825** Source: SCWA RPE: 77.19 ft, NAVD88
Aquifer Zone: Tehama (general)



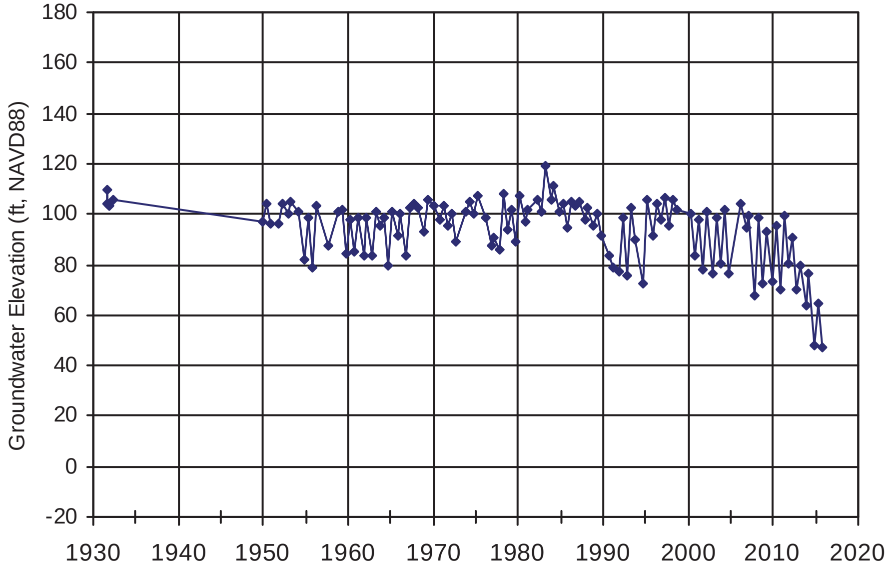
WellID: **07N01E33A001M** Source: DWR RPE: 70.58 ft, NAVD88
Aquifer Zone: Tehama (general)



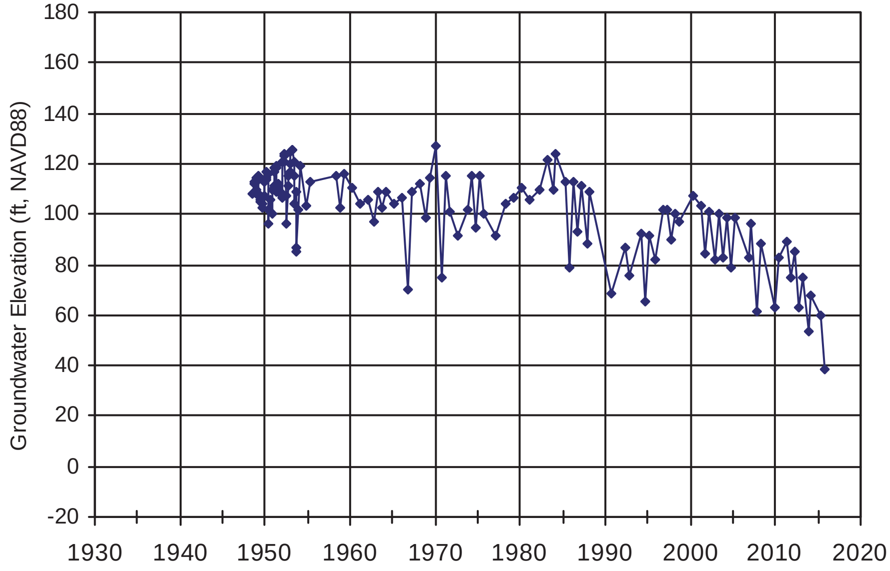

WellID: **07N01W01E003M** Source: DWR RPE: 108.3 ft, NAVD88
Aquifer Zone: Tehama (general)



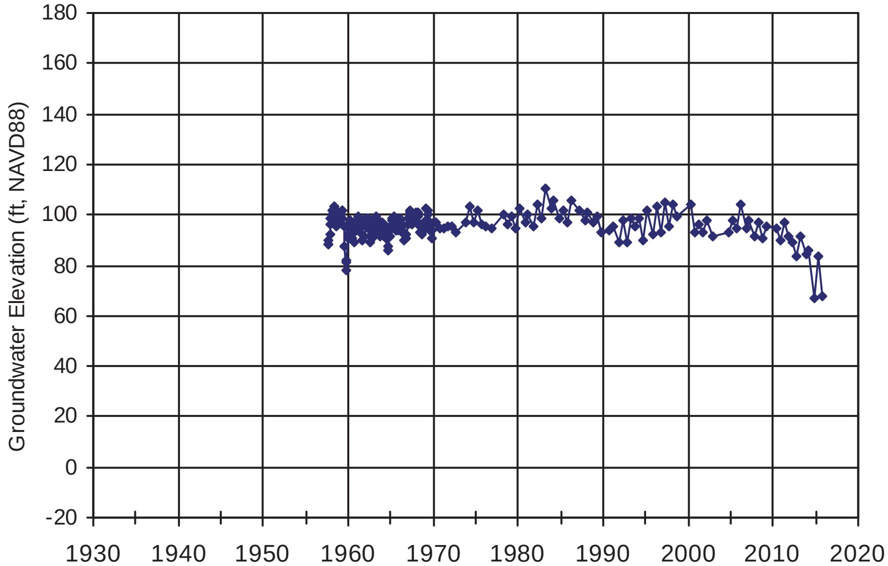

WellID: **07N01W04C002M** Source: DWR RPE: 148.4 ft, NAVD88
Aquifer Zone: Tehama (general)



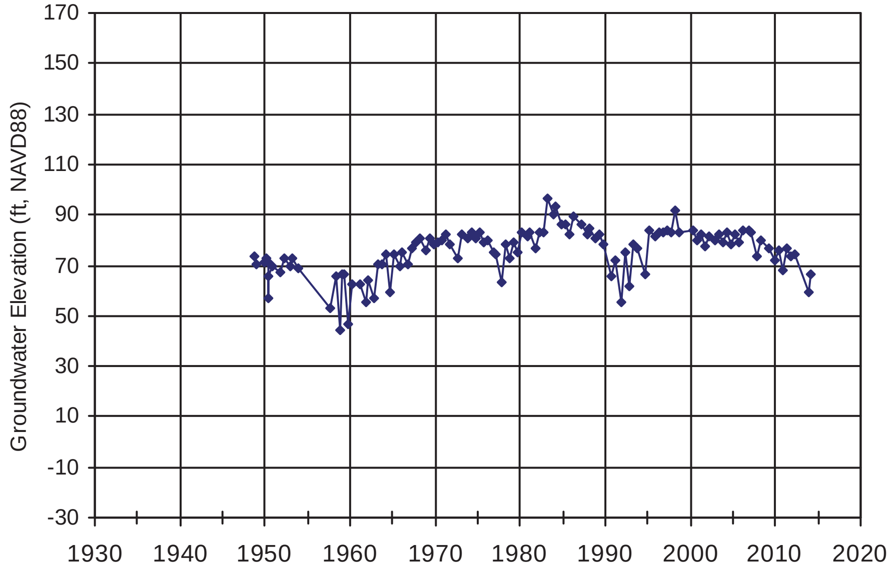

WellID: **07N01W05R001M** Source: DWR RPE: 173.1 ft, NAVD88
Aquifer Zone: Tehama (general)



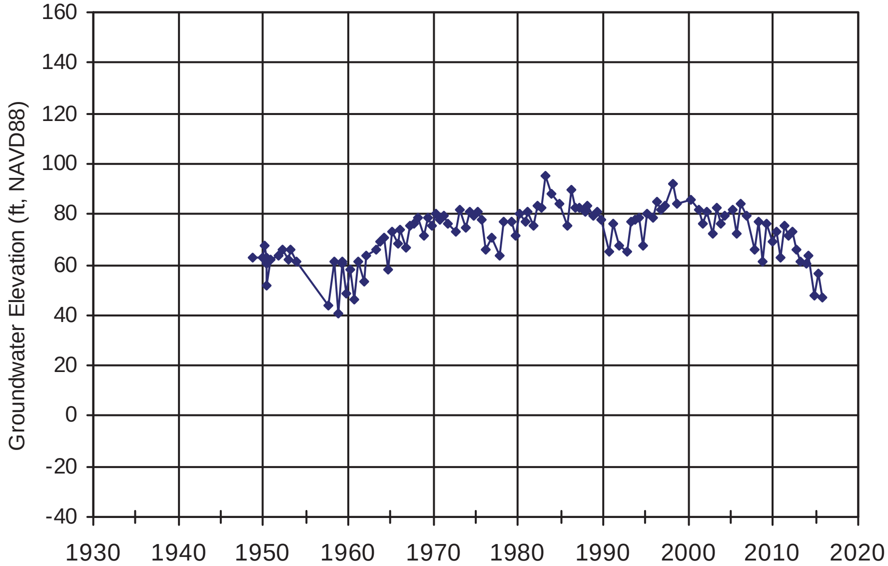
WellID: **08N01W33A001M** Source: DWR RPE: 137.8 ft, NAVD88
Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium



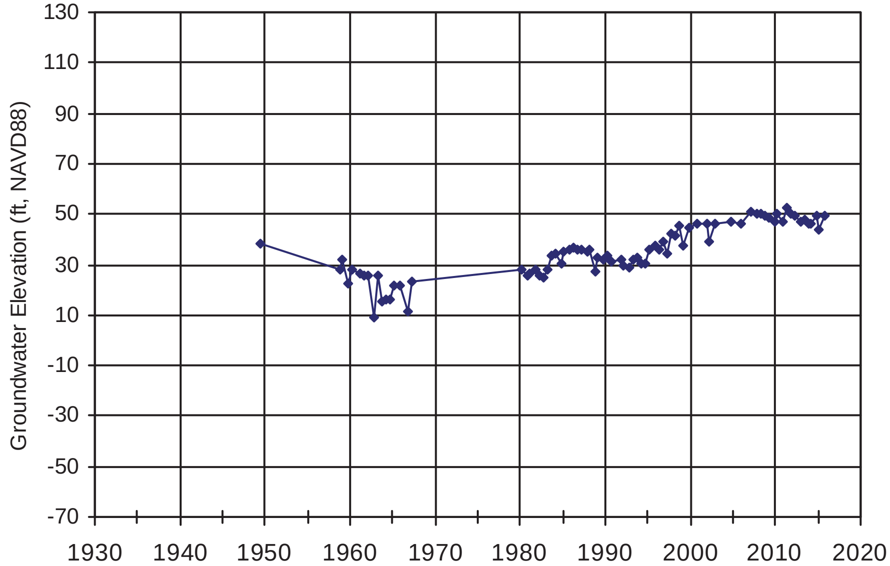

WellID: **08N01W35G002M** Source: DWR RPE: 114.09 ft, NAVD88
Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium




WellID: **08N01W36H001M** Source: DWR RPE: 106.59 ft, NAVD88
Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium

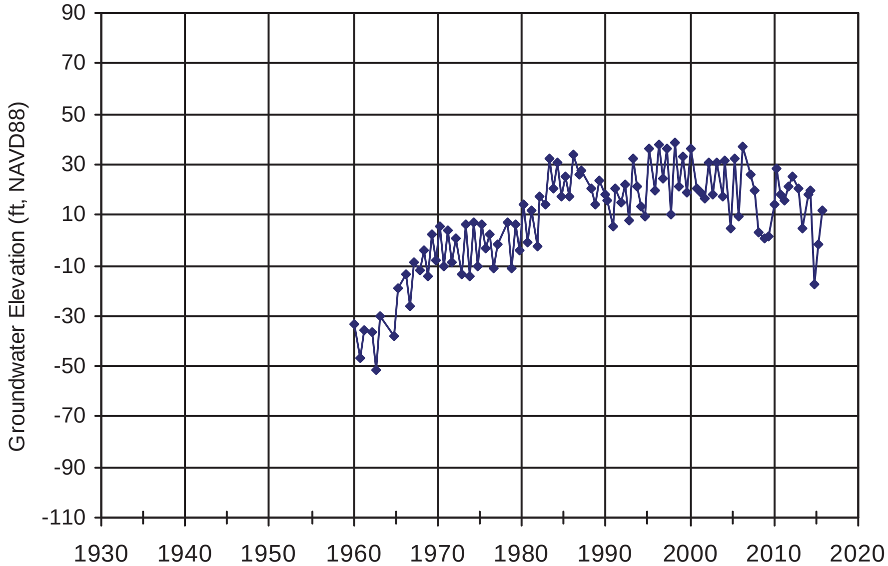



WellID: **04N01E02G001M** Source: DWR RPE: 73.52 ft, NAVD88
Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



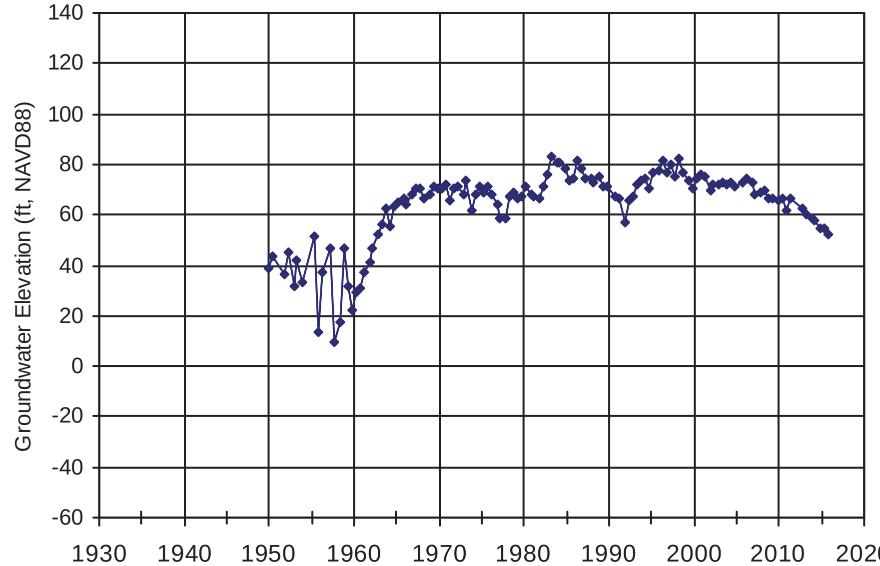
WellID: **06N01E12M003M** Source: DWR RPE: 42.55 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



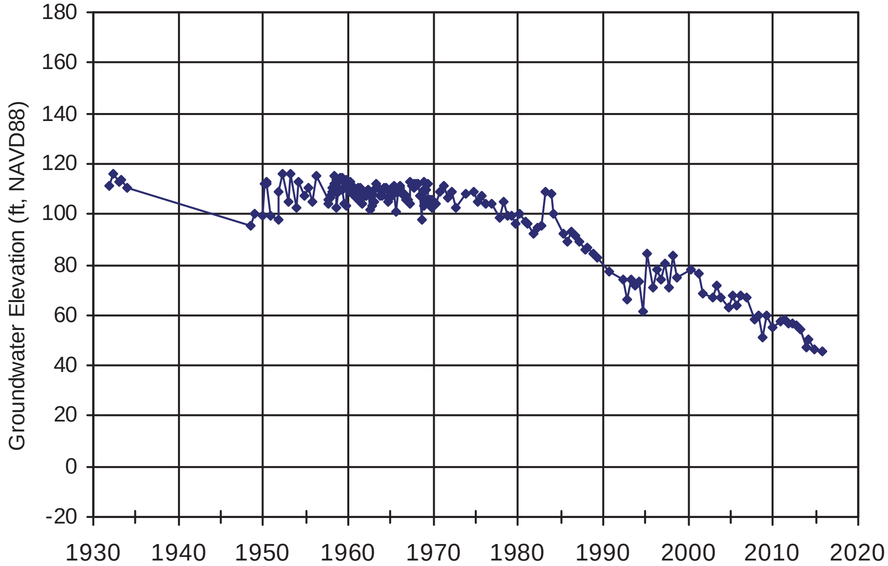

WellID: **07N01E04P003M** Source: DWR RPE: 92.6 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



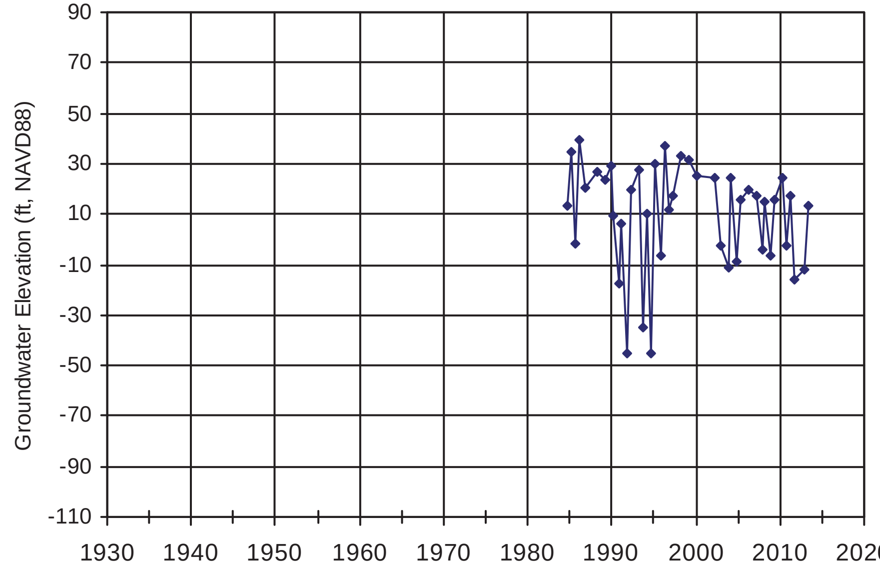

WellID: **07N01W06E001M** Source: DWR RPE: 160.15 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



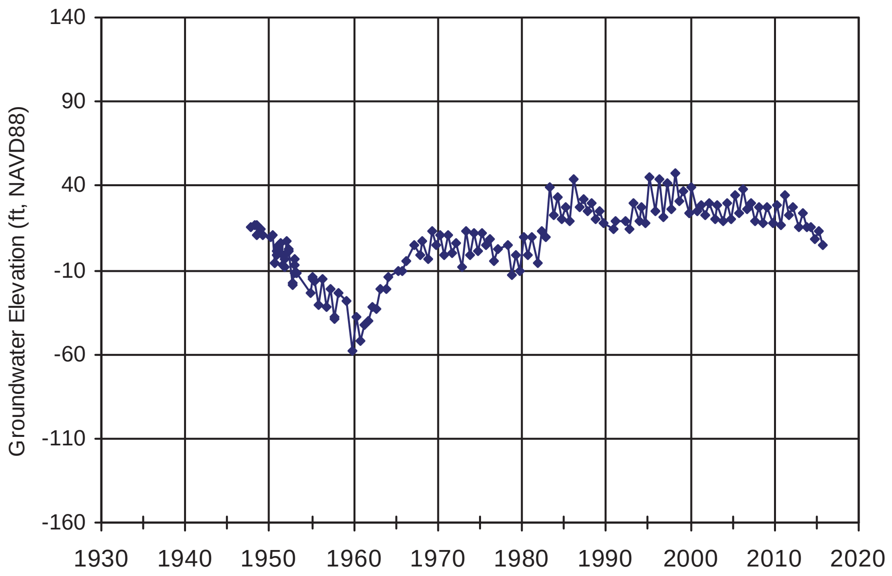

WellID: **07N02E06N003M** Source: DWR RPE: 63.05 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



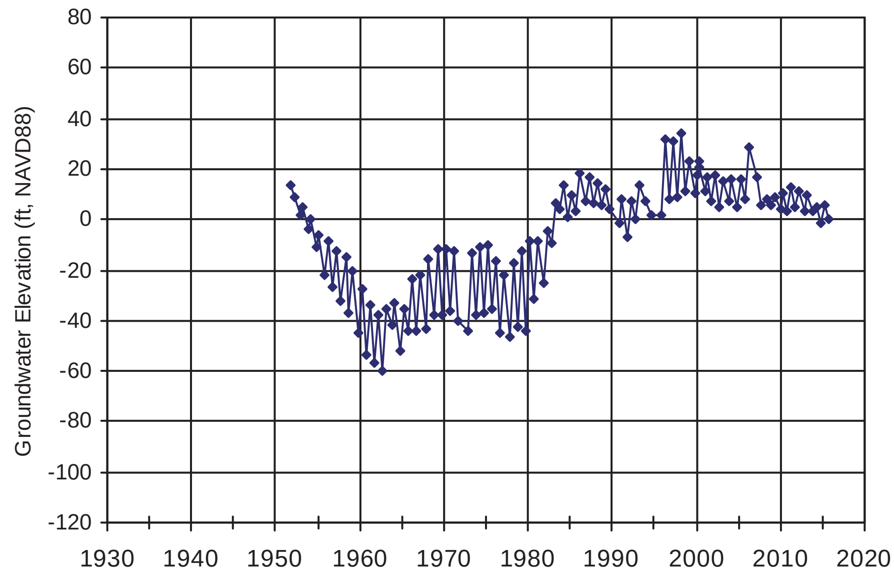
WellID: **07N02E19E001M** Source: DWR RPE: 53.26 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



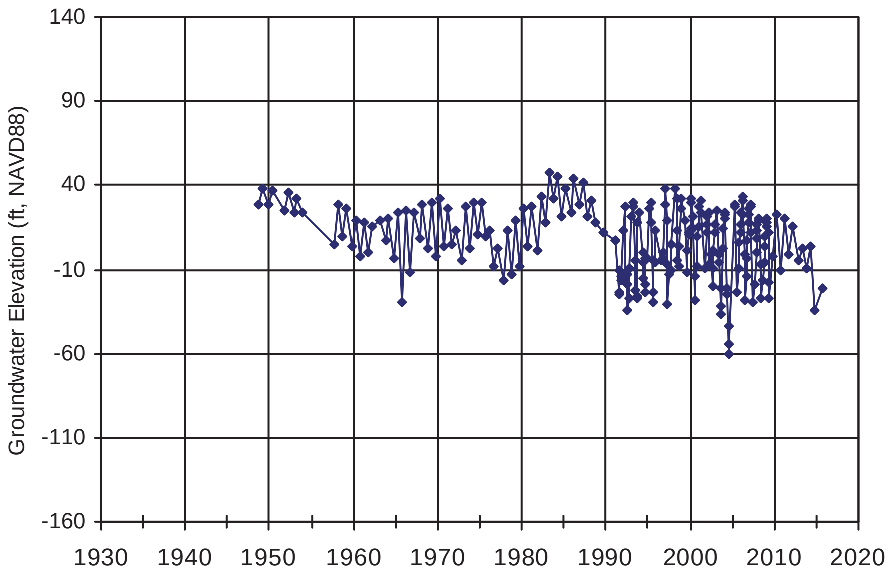

WellID: **07N02E33D002M** Source: DWR RPE: 36.04 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



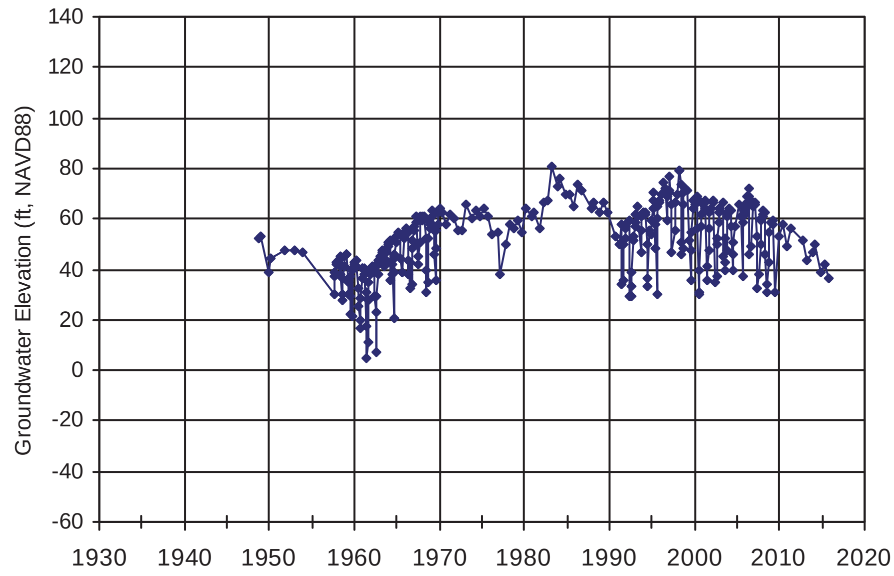

WellID: **08N01E24Q001M** Source: DWR RPE: 71 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



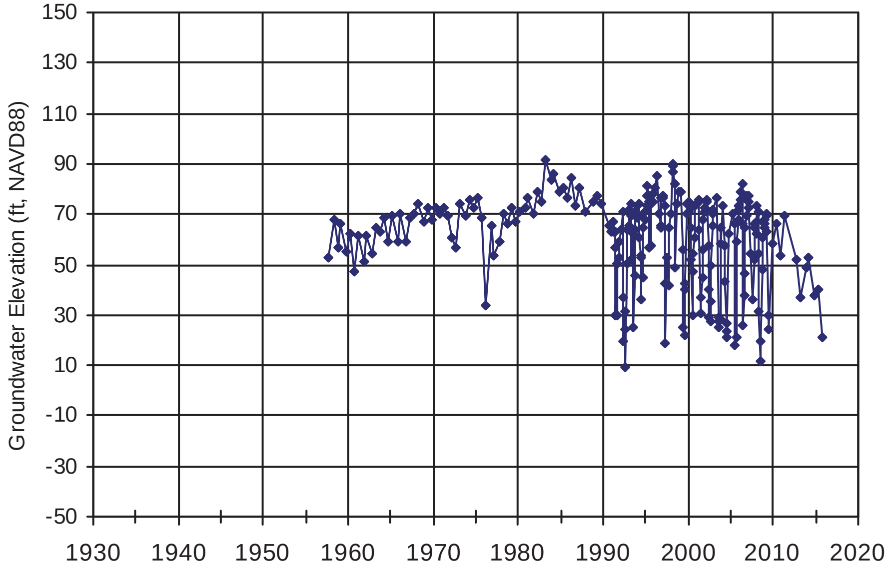

WellID: **08N01E28G001M** Source: DWR RPE: 96.1 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



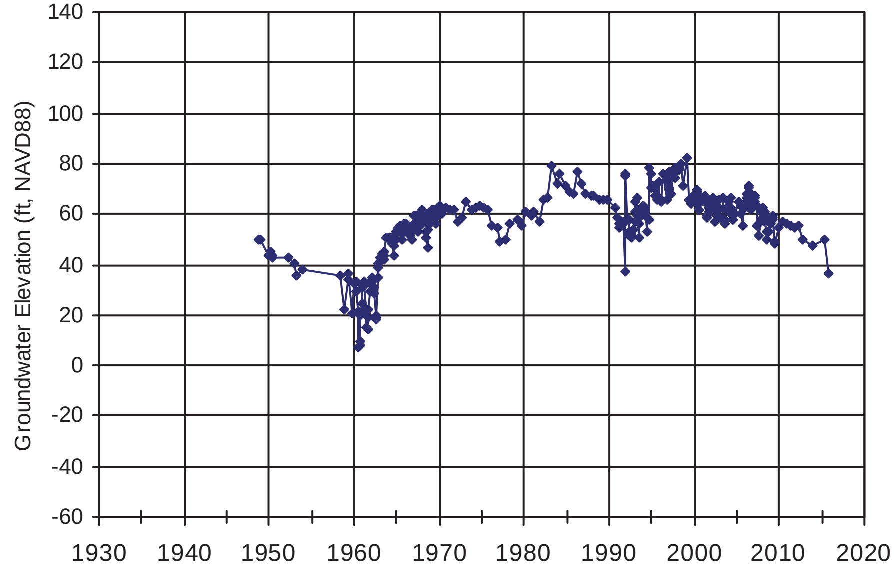
WellID: **08N01E30G002M** Source: DWR RPE: 112.8 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



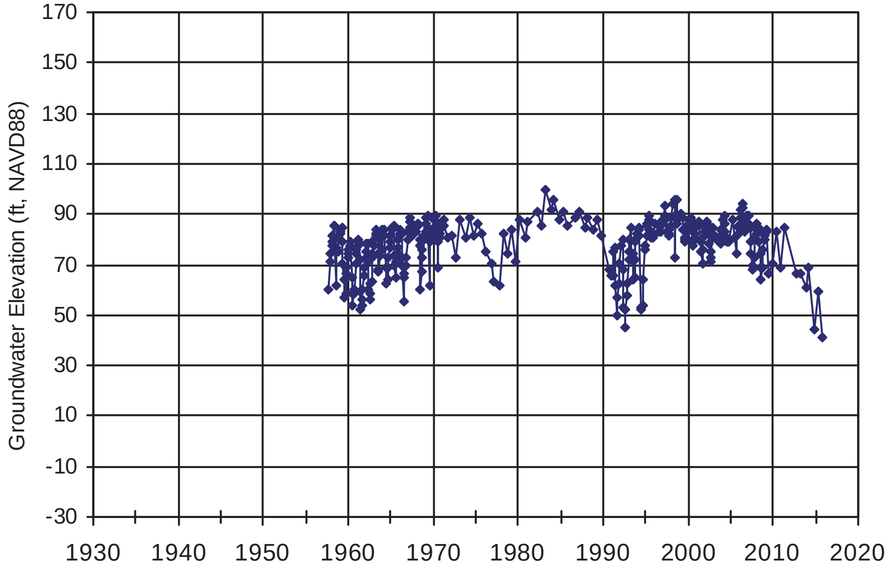

WellID: **08N01E33H001M** Source: DWR RPE: 84.57 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



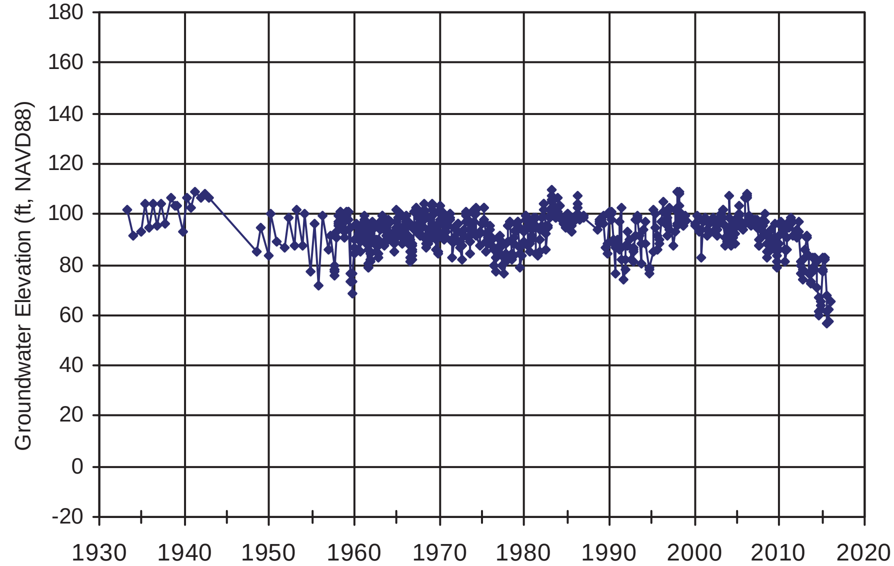

WellID: **08N01W26D005M** Source: DWR RPE: 129.2 ft, NAVD88

Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)

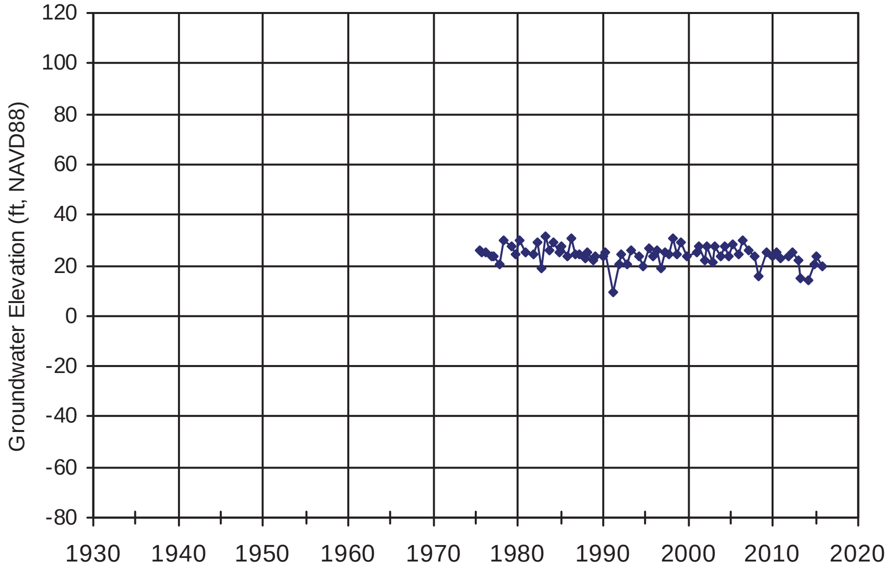



WellID: **08N01W28J001M** Source: DWR RPE: 141.61 ft, NAVD88

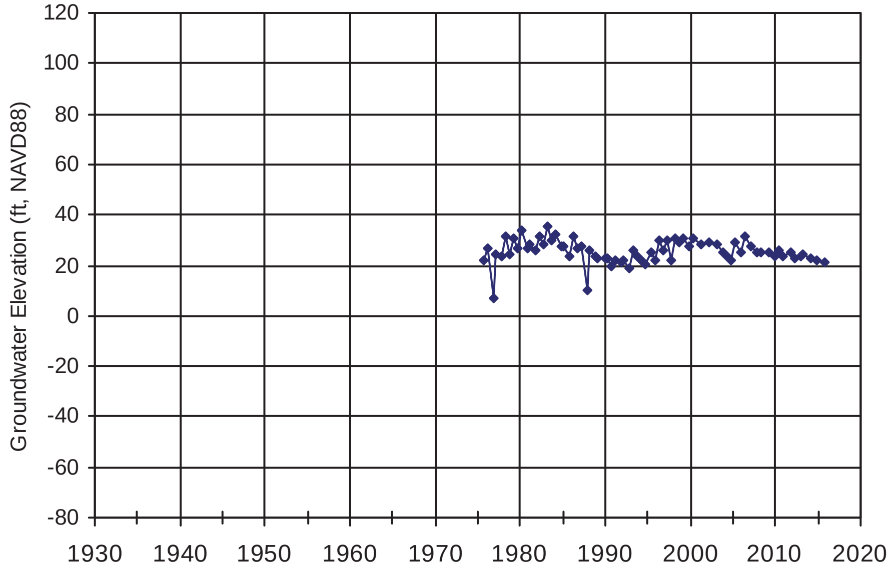
Aquifer Zone: Tehama (general, primary) & Quaternary Alluvium (possible)



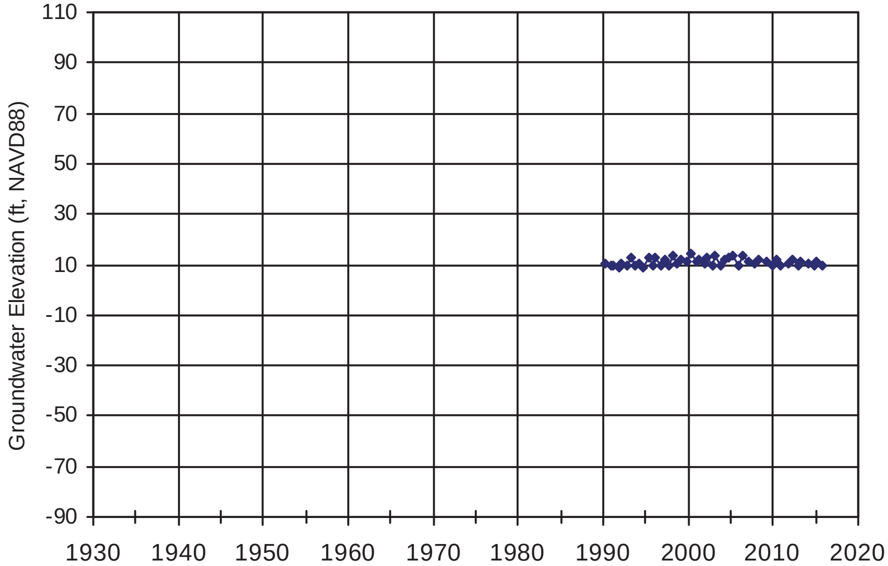
WellID: **04N01E17Q002M** Source: DWR RPE: 41.53 ft, NAVD88
Aquifer Zone: Unknown



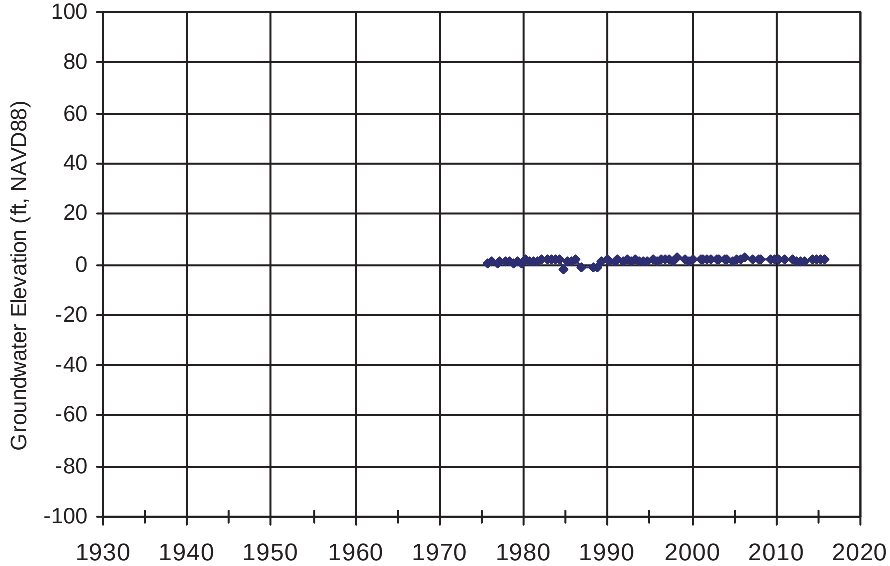

WellID: **04N01E20F001M** Source: DWR RPE: 46.83 ft, NAVD88
Aquifer Zone: Unknown



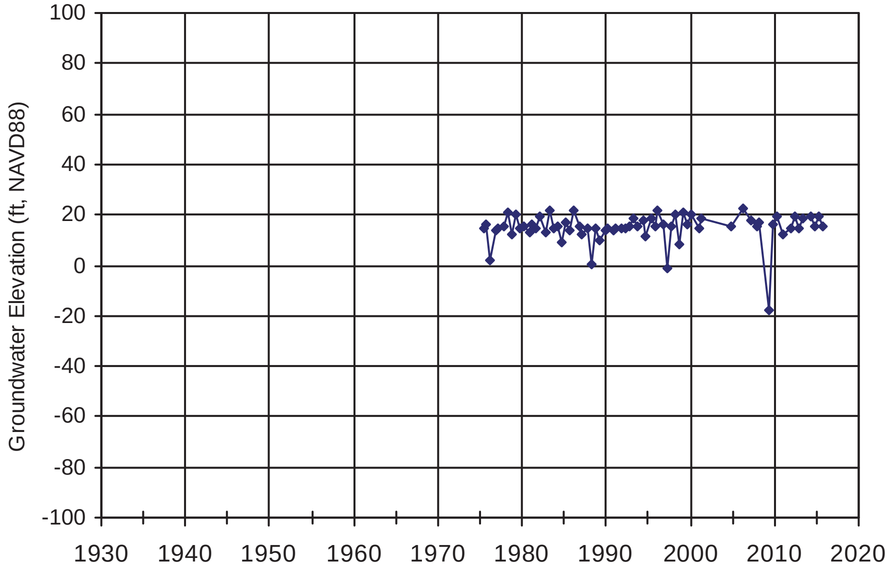

WellID: **04N01W03J001M** Source: DWR RPE: 22.56 ft, NAVD88
Aquifer Zone: Unknown



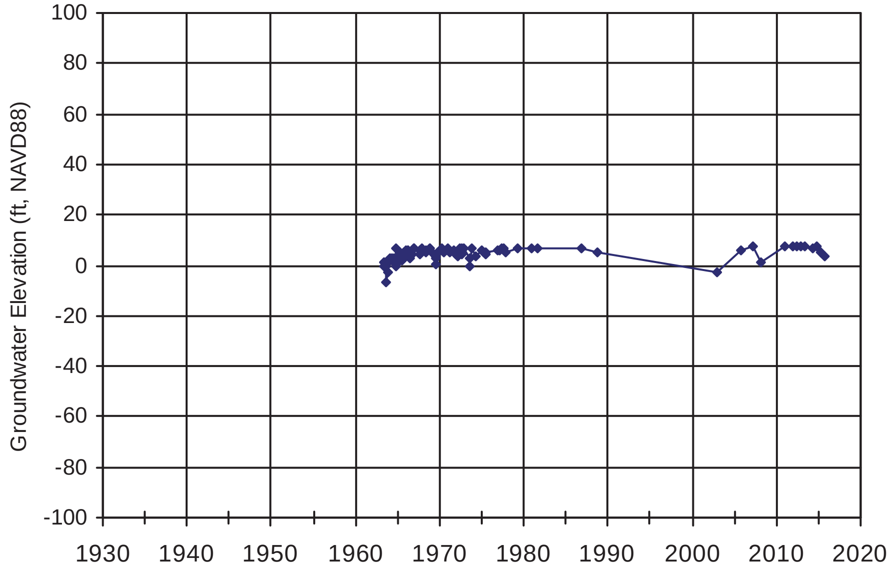

WellID: **04N01W32G001M** Source: DWR RPE: 3.94 ft, NAVD88
Aquifer Zone: Unknown



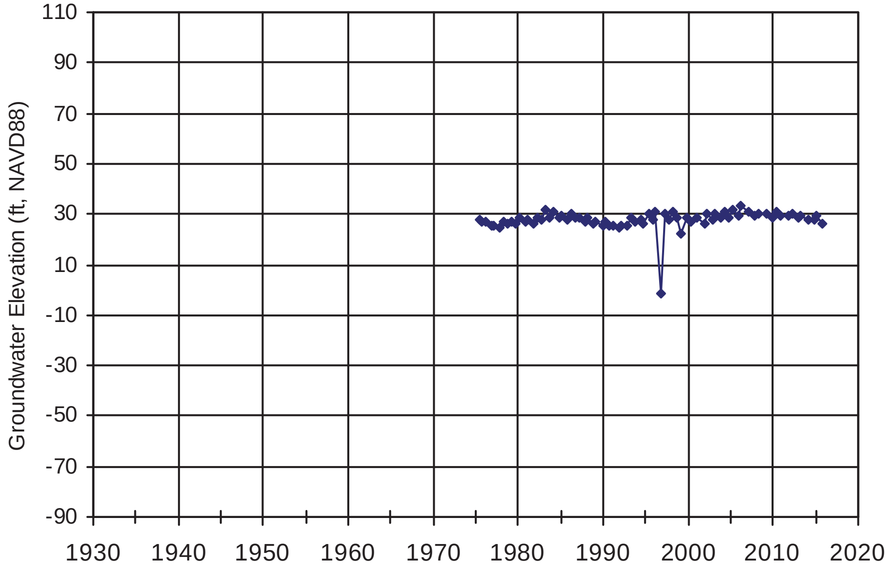
WellID: **04N02W05L007M** Source: DWR RPE: 23.6 ft, NAVD88
Aquifer Zone: Unknown



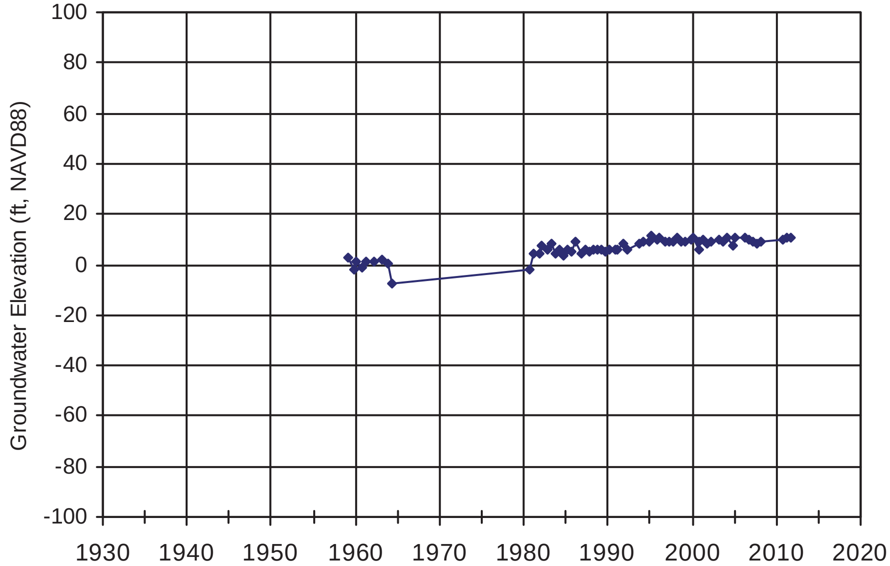

WellID: **04N02W09H001M** Source: DWR RPE: 7.19 ft, NAVD88
Aquifer Zone: Unknown



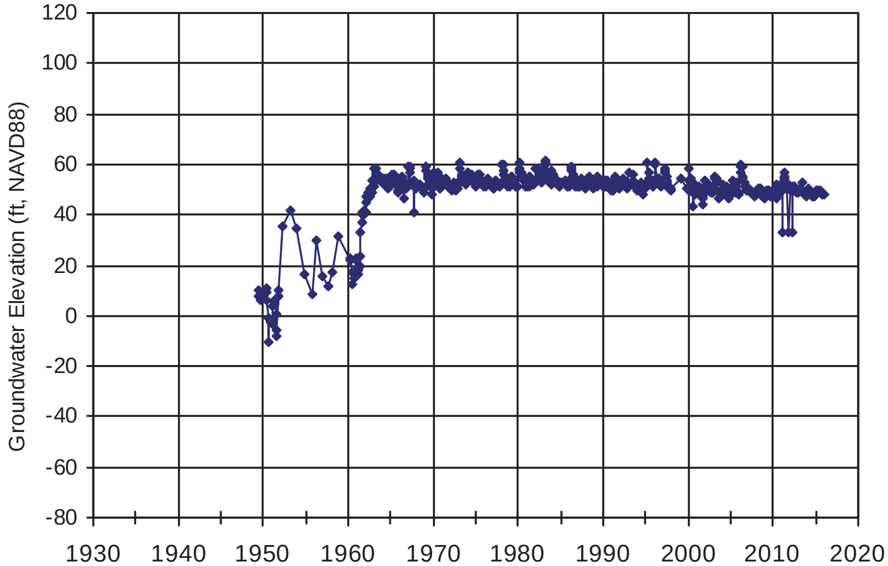

WellID: **04N03W12G001M** Source: DWR RPE: 46.39 ft, NAVD88
Aquifer Zone: Unknown



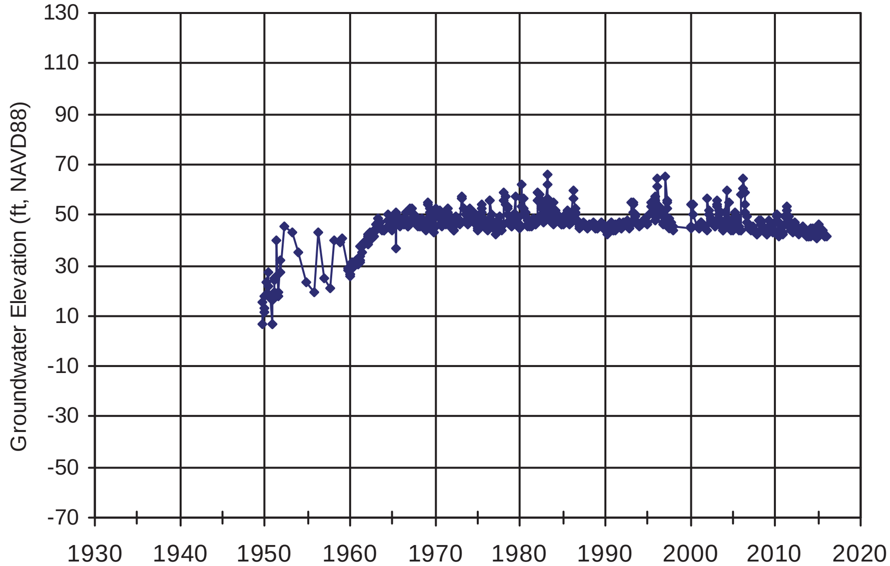

WellID: **05N02E07R002M** Source: DWR RPE: 18.5 ft, NAVD88
Aquifer Zone: Unknown



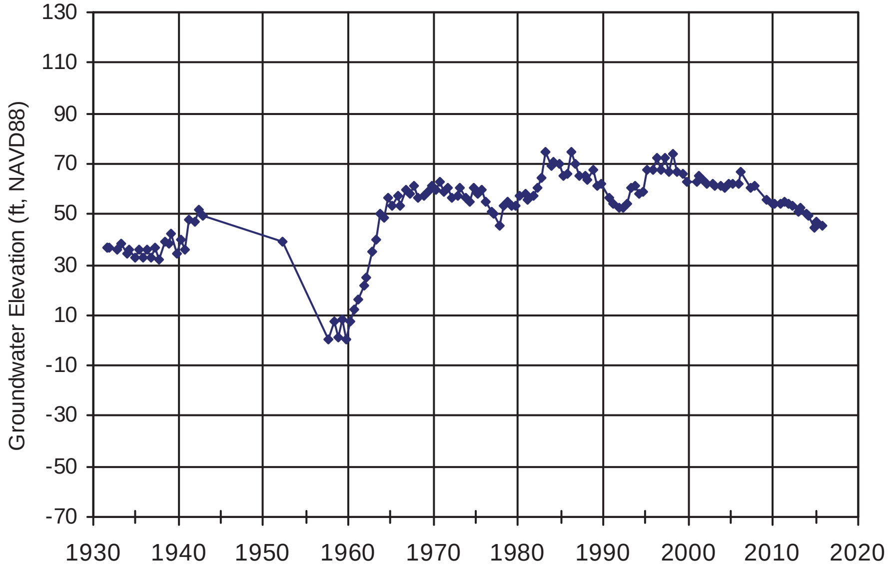
WellID: **05N02W21P003M** Source: DWR RPE: 63.32 ft, NAVD88
Aquifer Zone: Unknown



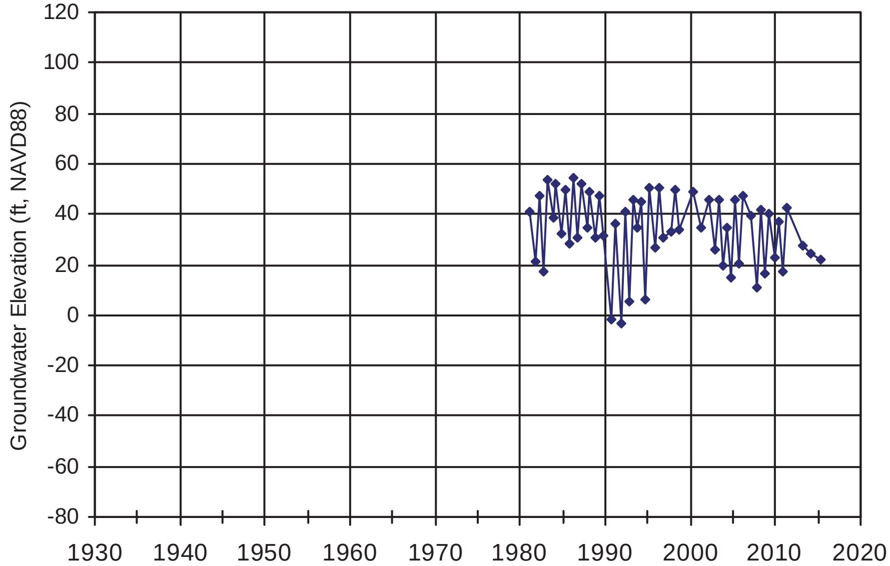

WellID: **05N02W30J001M** Source: DWR RPE: 68.02 ft, NAVD88
Aquifer Zone: Unknown



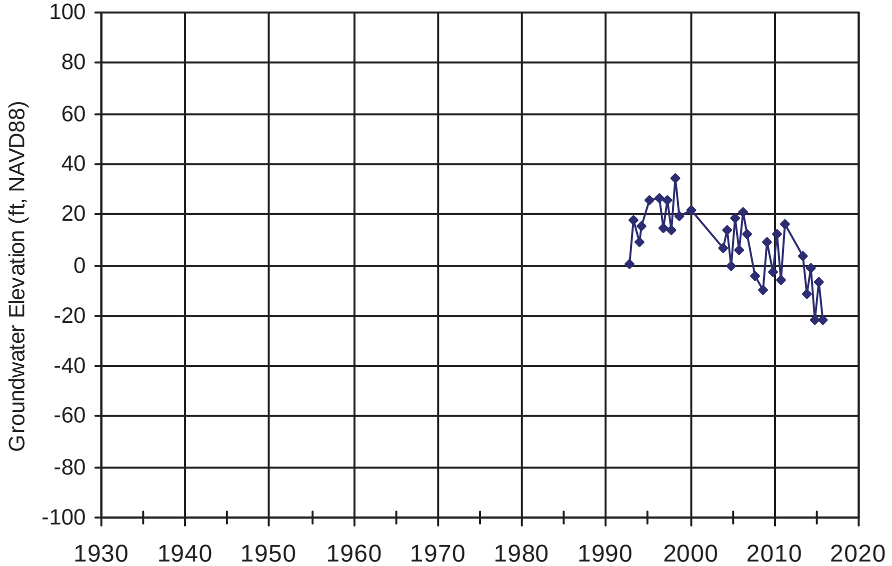

WellID: **07N01E10E001M** Source: DWR RPE: 81.58 ft, NAVD88
Aquifer Zone: Unknown



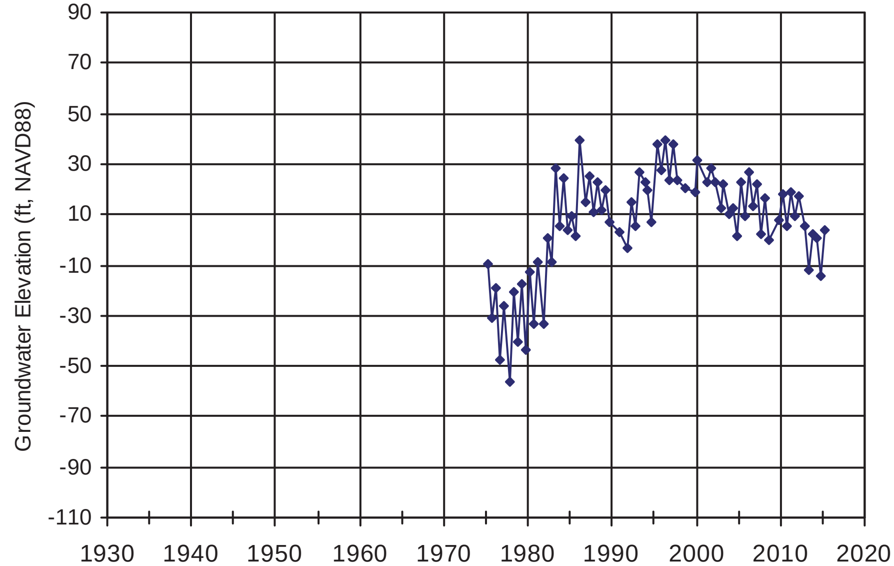

WellID: **07N01E27M004M** Source: DWR RPE: 68.6 ft, NAVD88
Aquifer Zone: Unknown



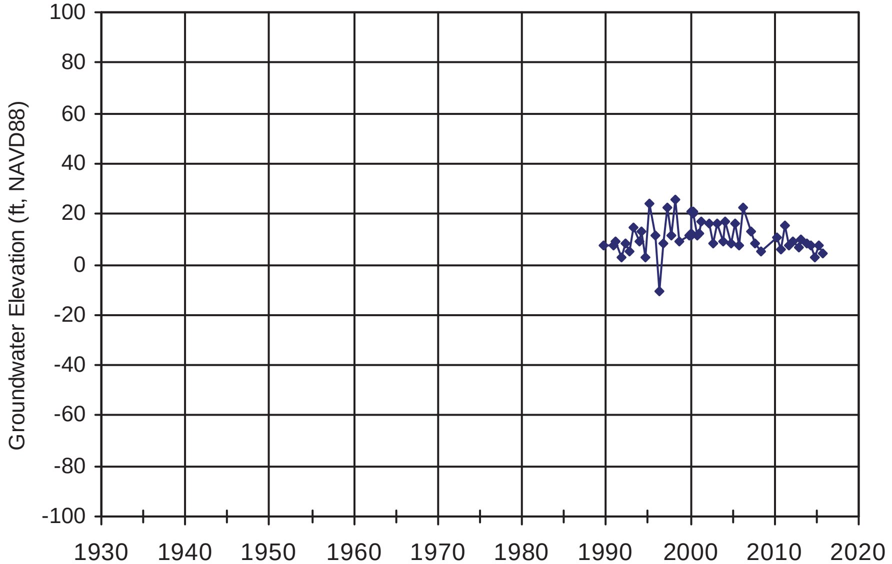
WellID: **07N02E04M004M** Source: DWR RPE: 53.5 ft, NAVD88
Aquifer Zone: Unknown



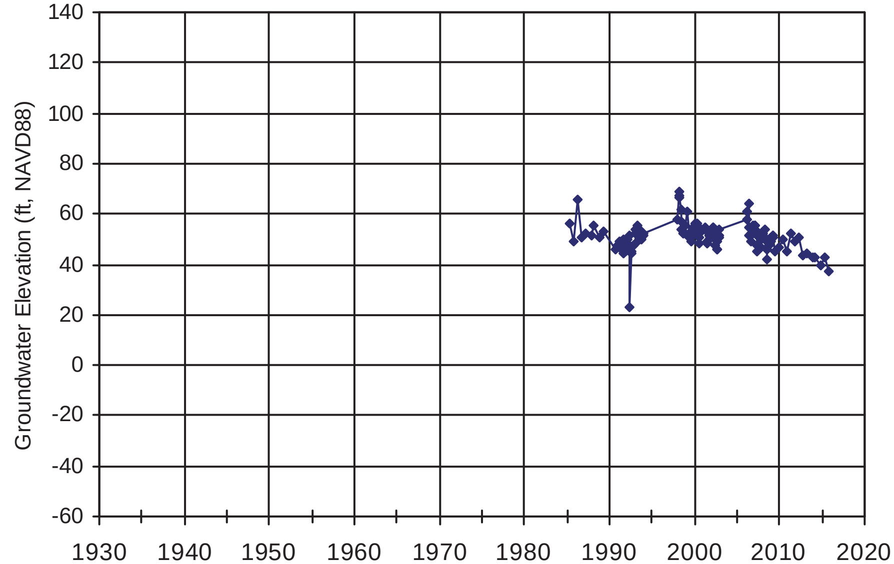

WellID: **07N02E21F003M** Source: DWR RPE: 48.64 ft, NAVD88
Aquifer Zone: Unknown



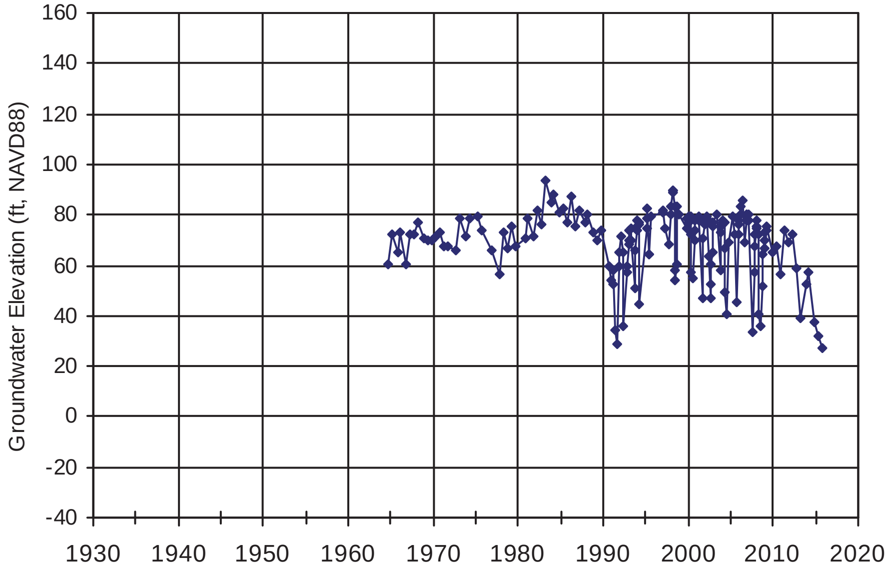

WellID: **07N02E26Q003M** Source: DWR RPE: 31.32 ft, NAVD88
Aquifer Zone: Unknown



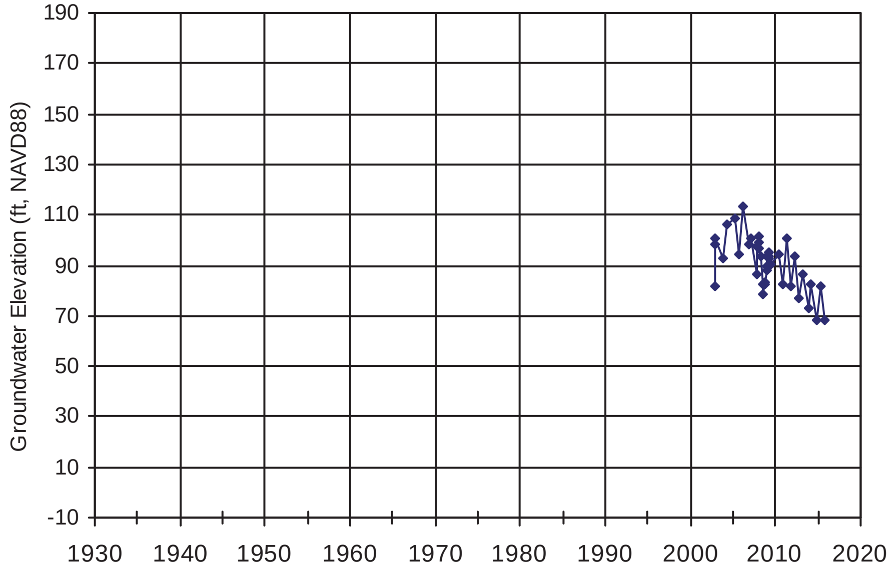

WellID: **08N01E15P002M** Source: DWR RPE: 89.57 ft, NAVD88
Aquifer Zone: Unknown



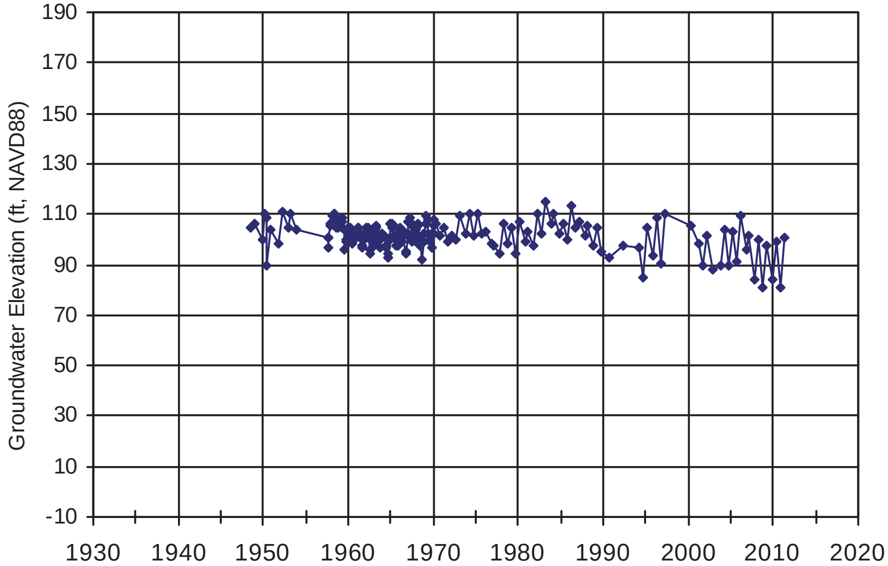
WellID: **08N01W25A002M** Source: DWR RPE: 117.08 ft, NAVD88
Aquifer Zone: Unknown



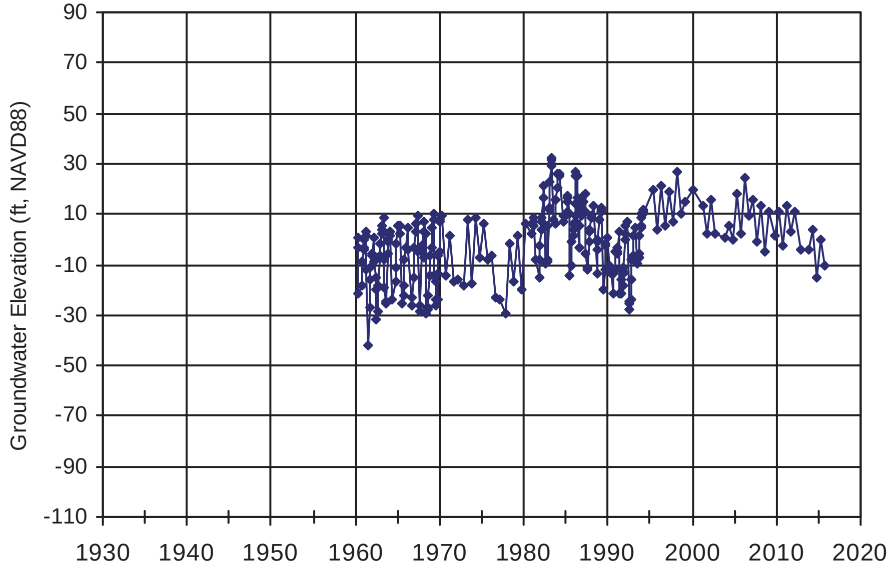

WellID: **08N01W32E002M** Source: DWR RPE: 150.1 ft, NAVD88
Aquifer Zone: Unknown




WellID: **08N01W32H001M** Source: DWR RPE: 144.1 ft, NAVD88
Aquifer Zone: Unknown

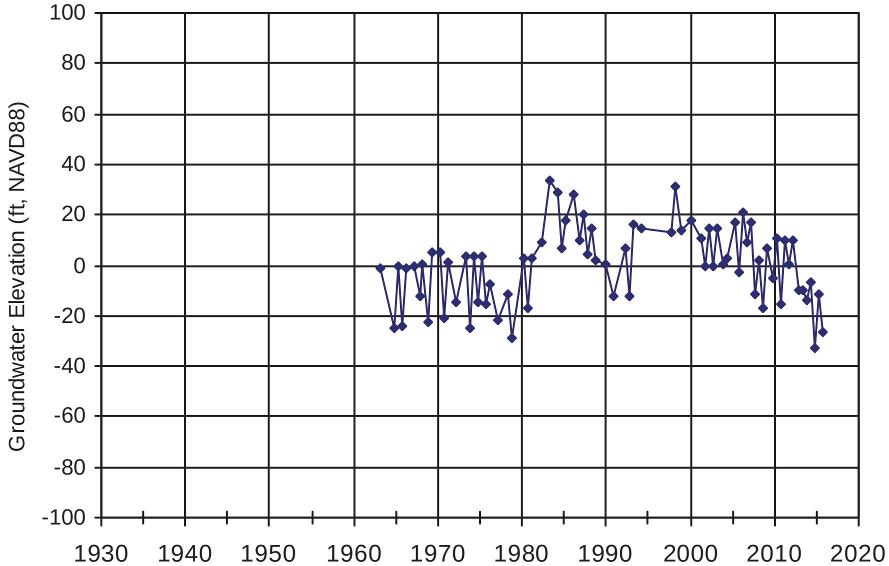



WellID: **08N02E24N001M** Source: DWR RPE: 41 ft, NAVD88
Aquifer Zone: Unknown



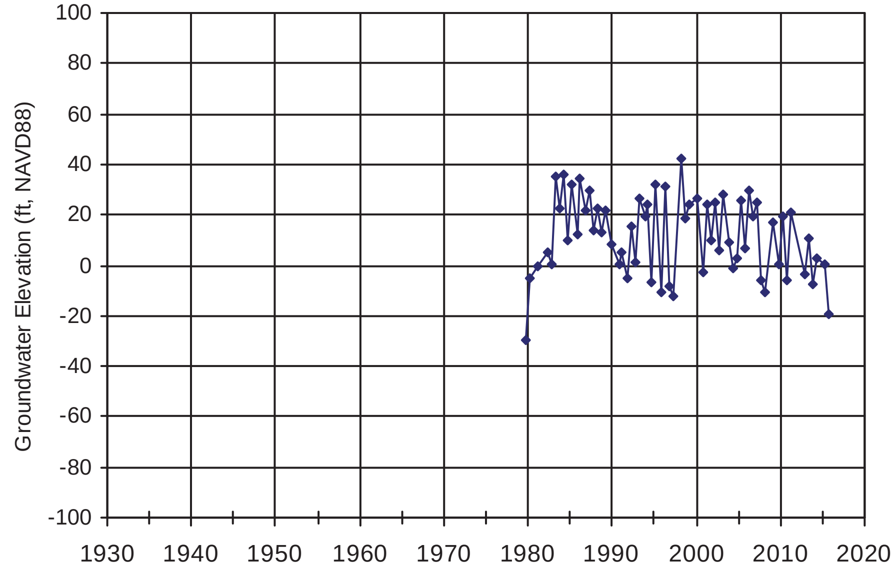
WellID: **08N02E27Q002M** Source: DWR RPE: 48.5 ft, NAVD88

Aquifer Zone: Unknown



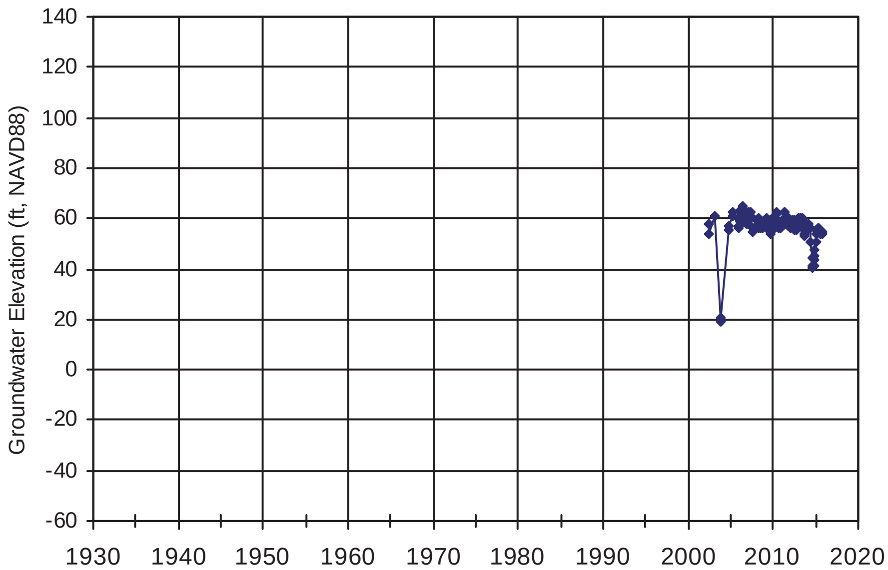

WellID: **08N02E32R001M** Source: DWR RPE: 59.5 ft, NAVD88

Aquifer Zone: Unknown



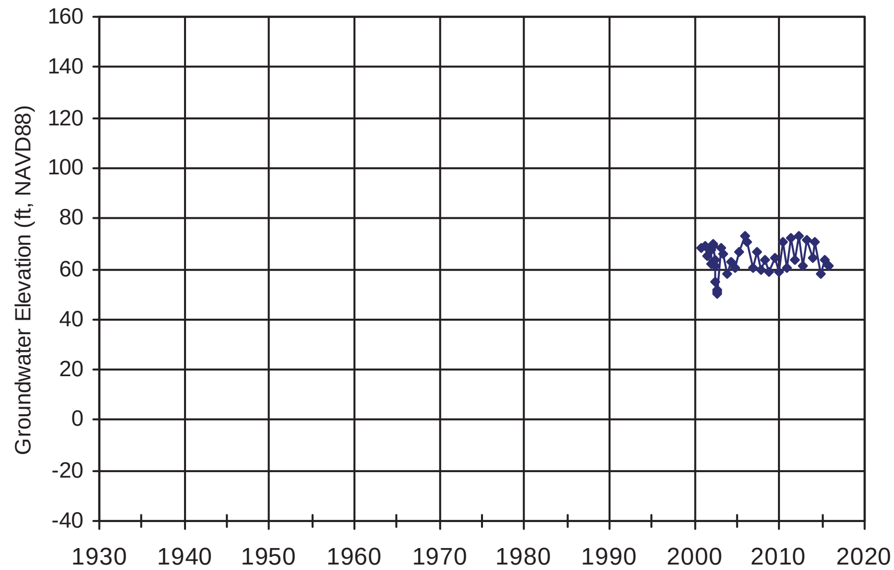

WellID: **DeMello** Source: CofV RPE: 82.45 ft, NAVD88

Aquifer Zone: Upper Tehama

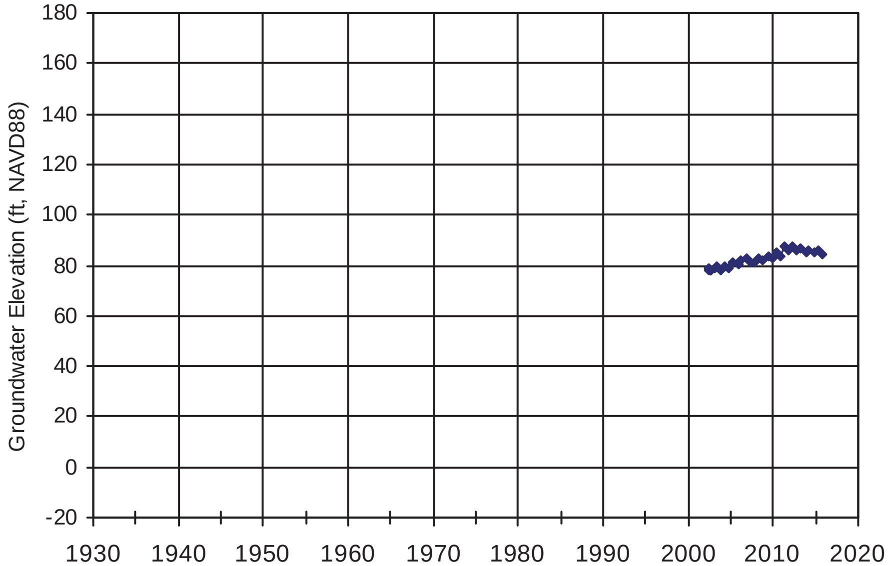



WellID: **MW-15-508ft** Source: CofV RPE: 95.39 ft, NAVD88

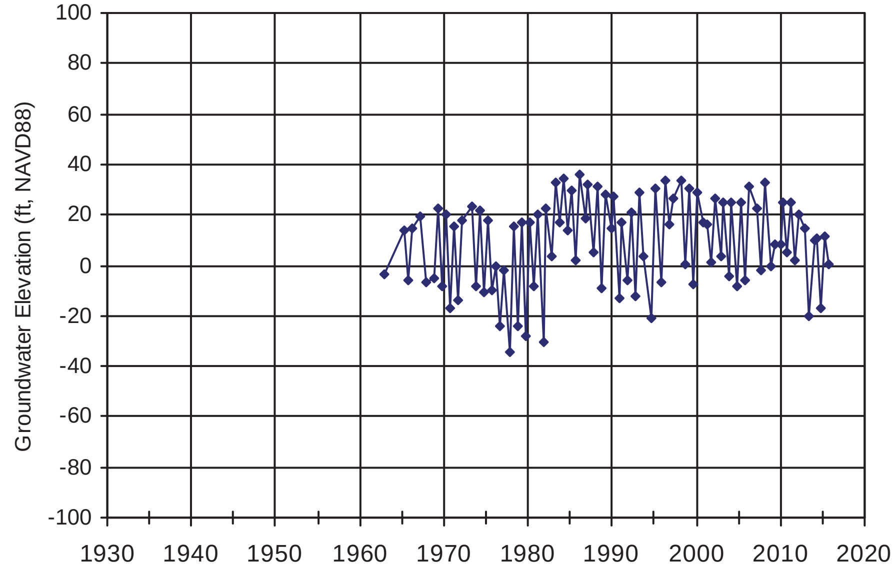
Aquifer Zone: Upper Tehama



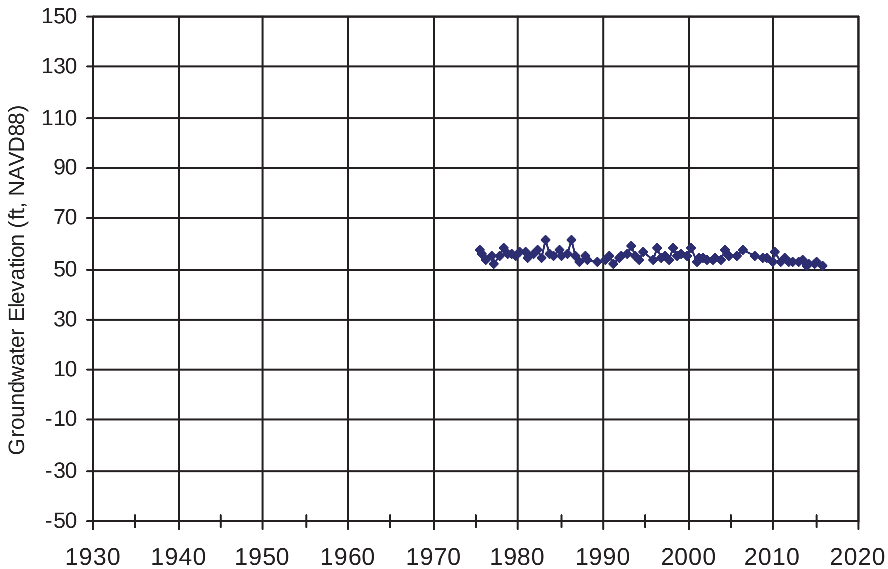
WellID: **MW-16-117ft** Source: CofV RPE: 103.3 ft, NAVD88
Aquifer Zone: Upper Tehama



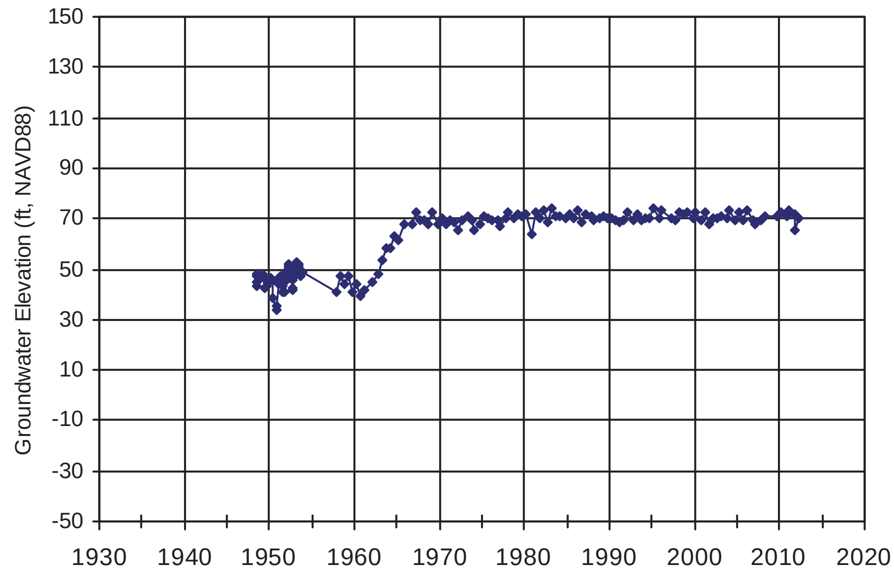

WellID: **06N01E02B001M** Source: DWR RPE: 49.57 ft, NAVD88
Aquifer Zone: Upper Tehama



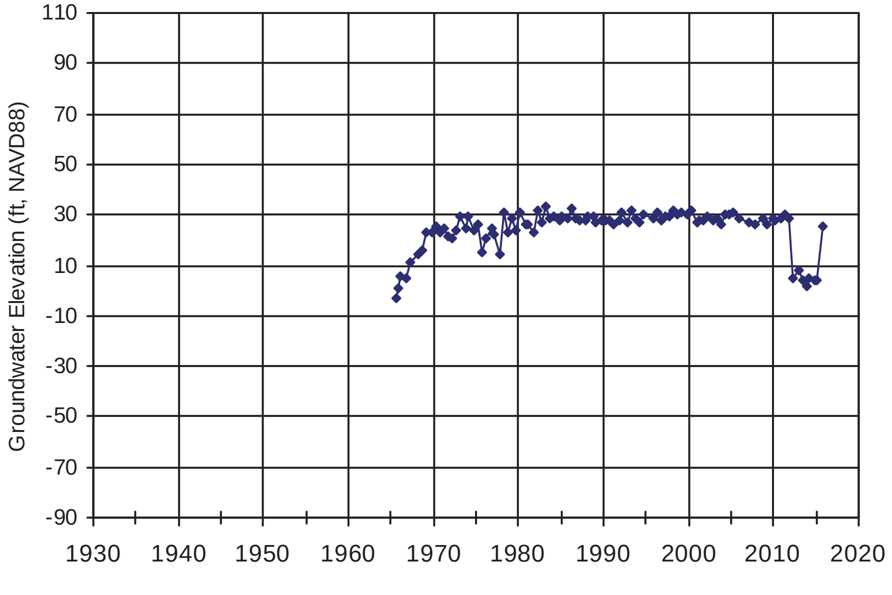

WellID: **06N01E05A001M** Source: DWR RPE: 65.18 ft, NAVD88
Aquifer Zone: Upper Tehama



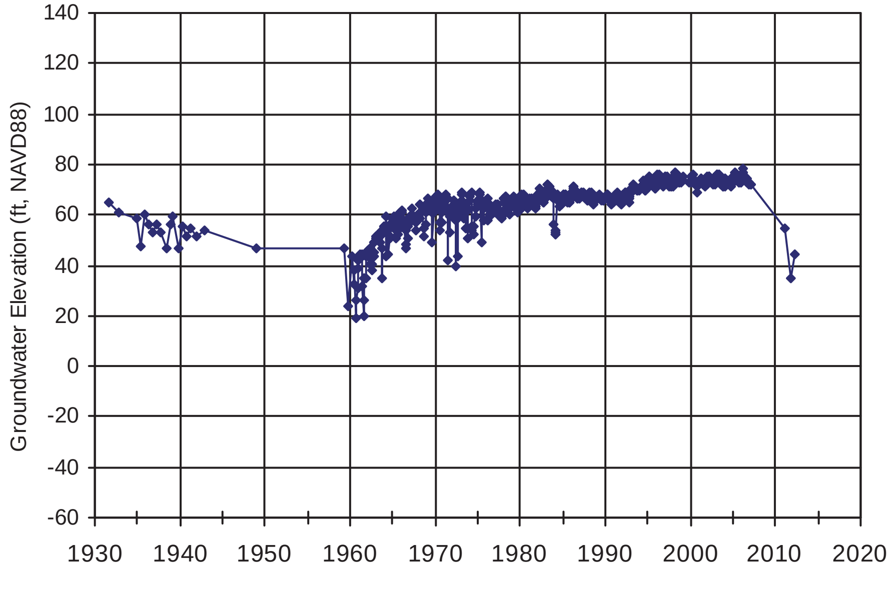

WellID: **06N01E18N001M** Source: DWR RPE: 75.57 ft, NAVD88
Aquifer Zone: Upper Tehama



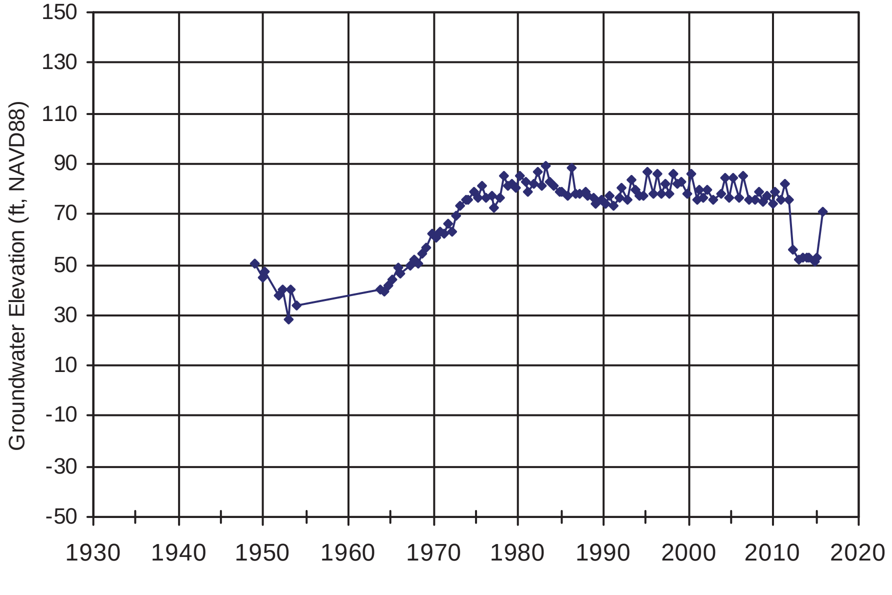
WellID: **06N01E24L003M** Source: DWR RPE: 35.04 ft, NAVD88
Aquifer Zone: Upper Tehama



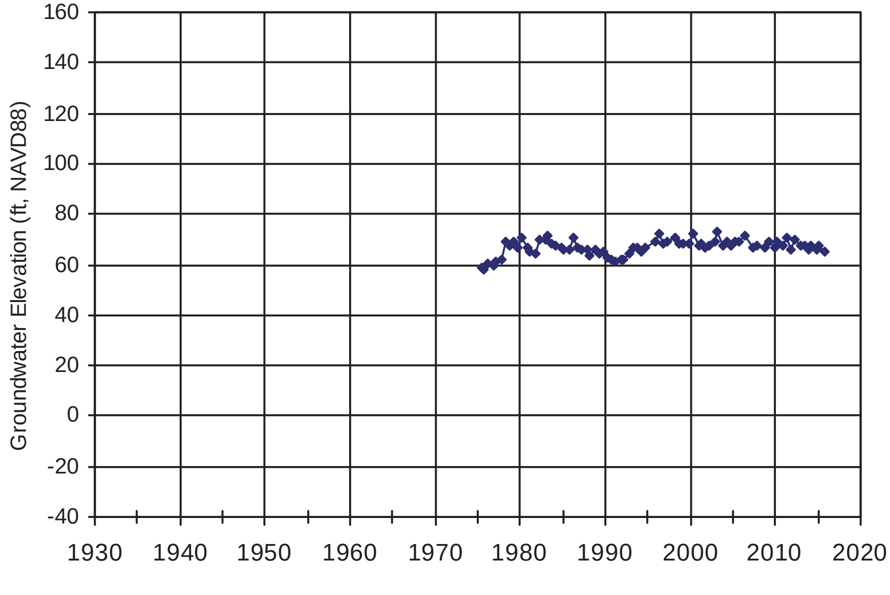

WellID: **06N01W01B001M** Source: DWR RPE: 84.59 ft, NAVD88
Aquifer Zone: Upper Tehama




WellID: **06N01W24N001M** Source: DWR RPE: 91.07 ft, NAVD88
Aquifer Zone: Upper Tehama

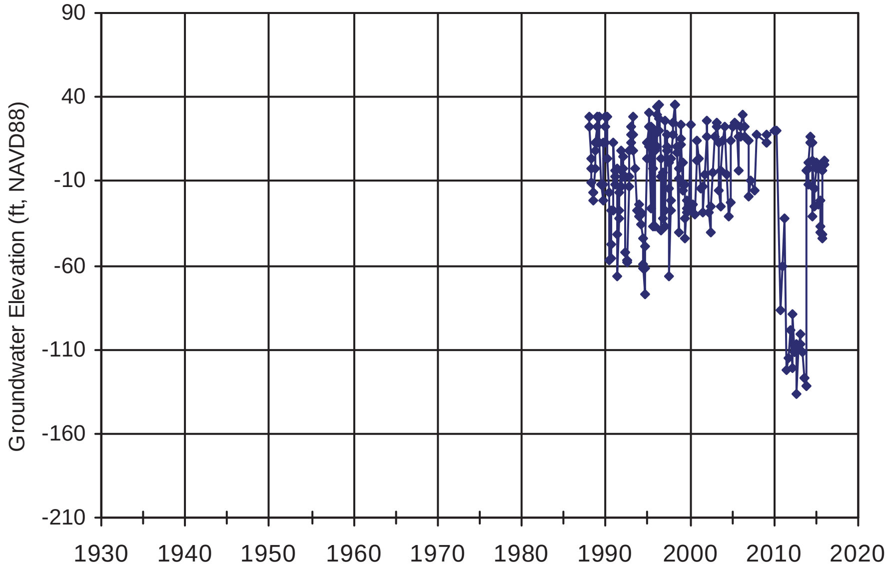



WellID: **06N01W36C004M** Source: DWR RPE: 82.86 ft, NAVD88
Aquifer Zone: Upper Tehama



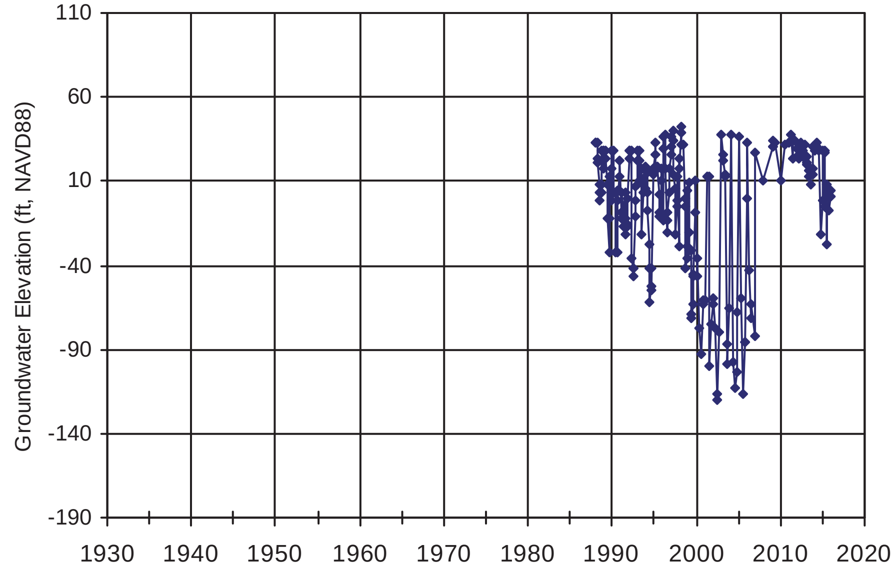
WellID: **07N01E13M001M** Source: CalWater RPE: 58 ft, NAVD88

Aquifer Zone: Upper Tehama



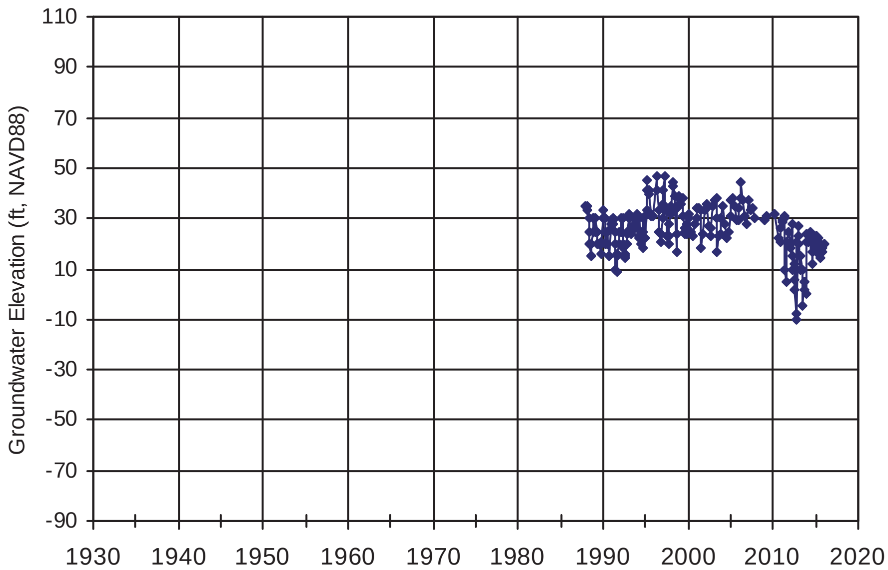

WellID: **07N01E14G002M** Source: CalWater RPE: 63 ft, NAVD88

Aquifer Zone: Upper Tehama



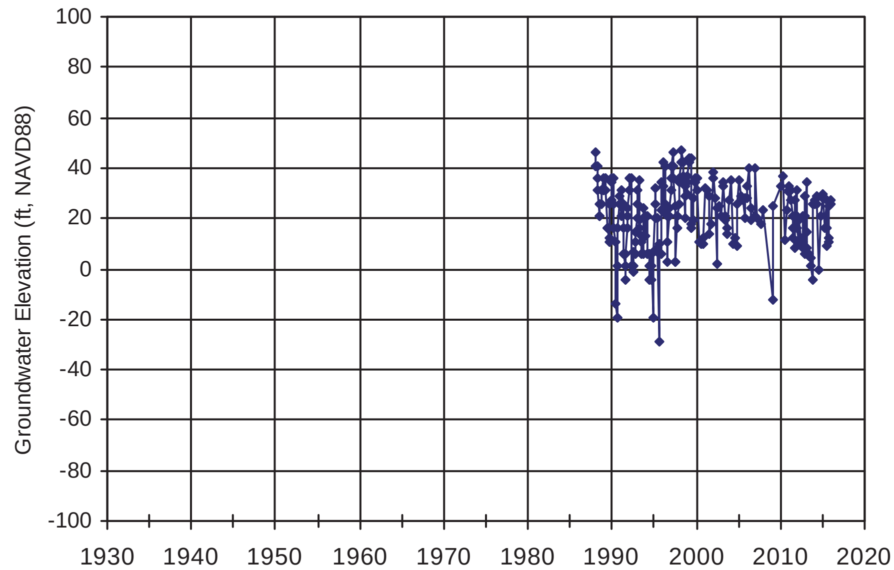

WellID: **07N01E14J001M** Source: CalWater RPE: 60 ft, NAVD88

Aquifer Zone: Upper Tehama

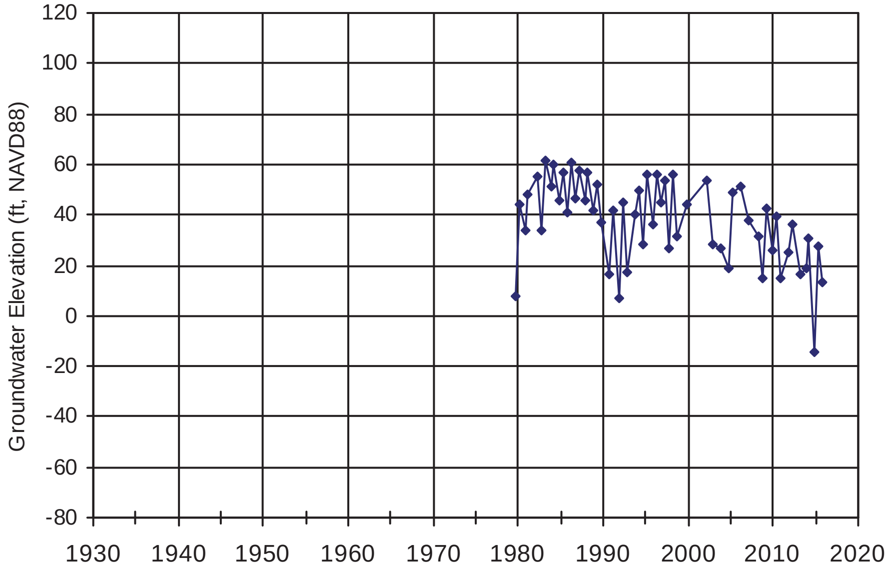



WellID: **07N01E14N003M** Source: CalWater RPE: 66 ft, NAVD88

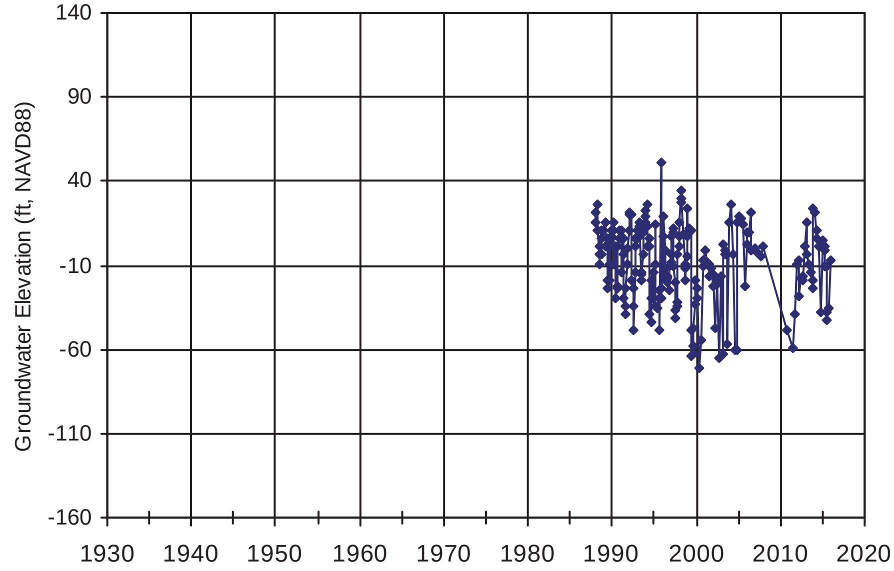
Aquifer Zone: Upper Tehama



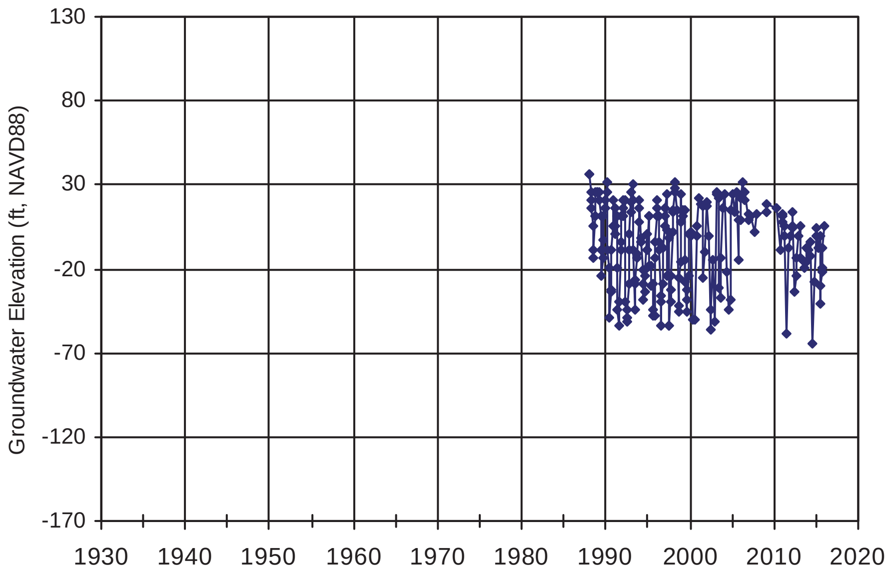
WellID: **07N01E21H003M** Source: DWR RPE: 73.58 ft, NAVD88
Aquifer Zone: Upper Tehama



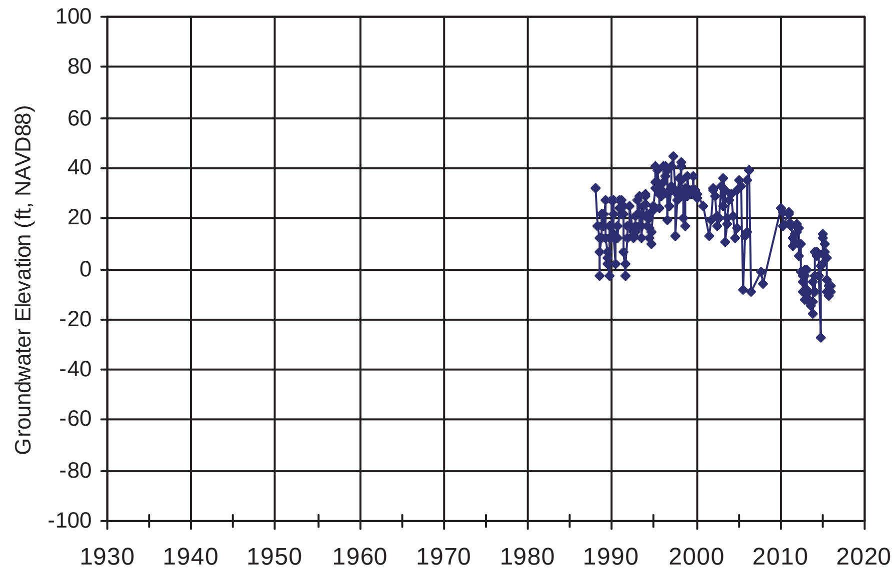

WellID: **07N01E23A004M** Source: CalWater RPE: 61 ft, NAVD88
Aquifer Zone: Upper Tehama




WellID: **07N01E23D002M** Source: CalWater RPE: 66 ft, NAVD88
Aquifer Zone: Upper Tehama

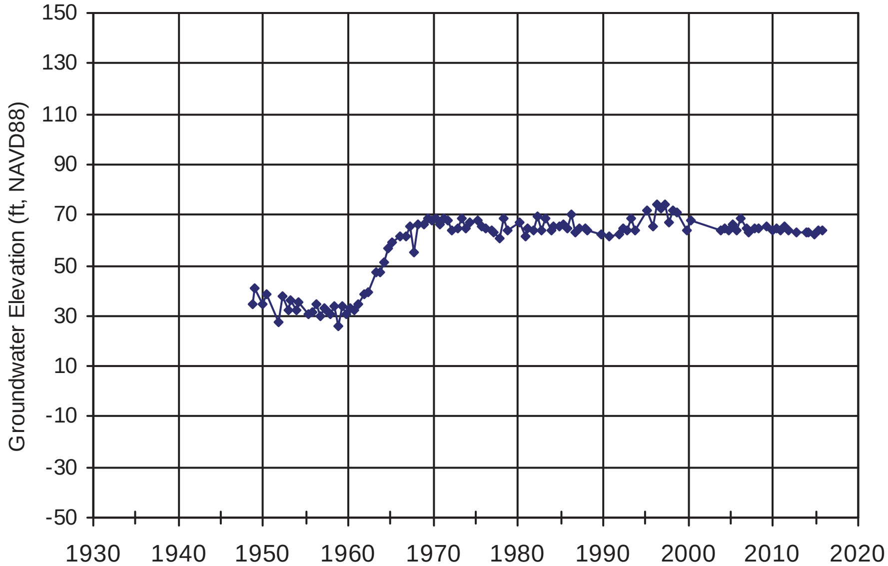



WellID: **07N01E24C002M** Source: CalWater RPE: 57 ft, NAVD88
Aquifer Zone: Upper Tehama



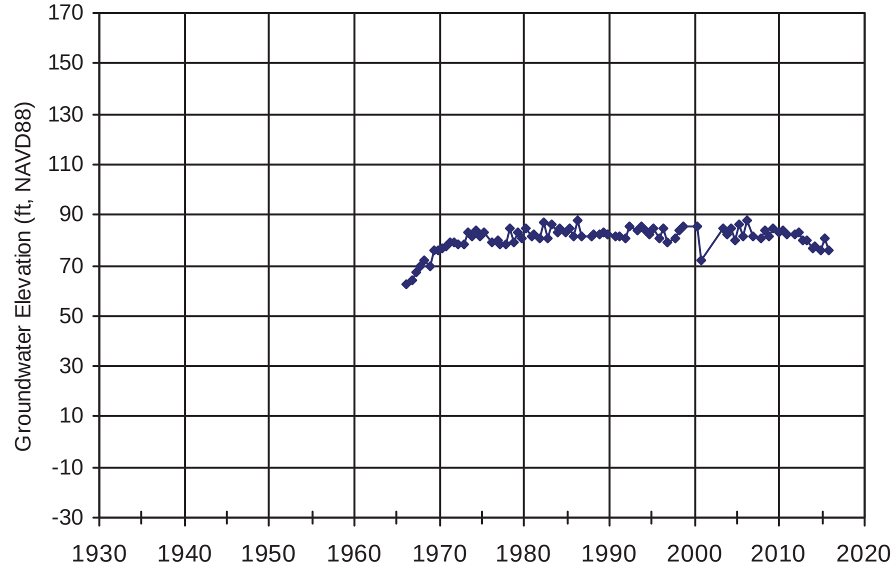
WellID: **07N01E29P001M** Source: DWR RPE: 76.59 ft, NAVD88

Aquifer Zone: Upper Tehama



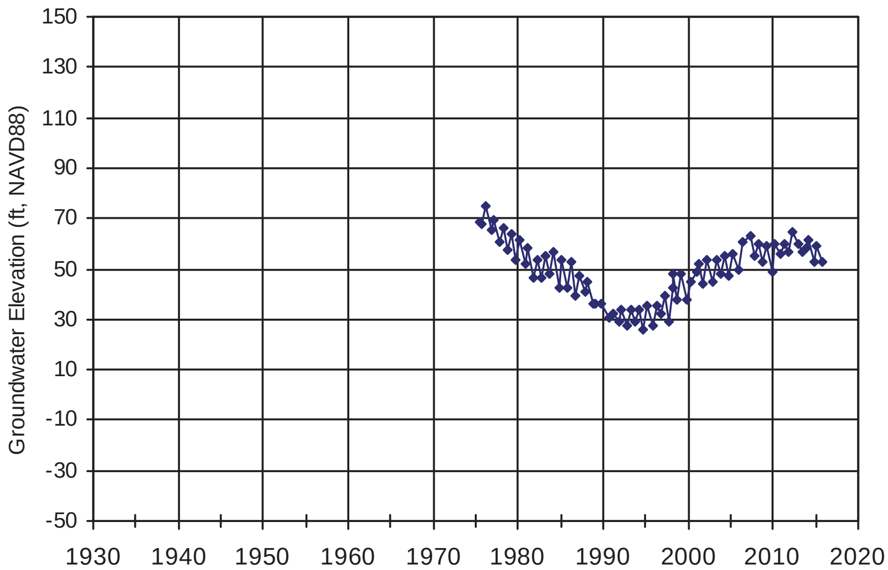

WellID: **07N01E30M001M** Source: DWR RPE: 90.59 ft, NAVD88

Aquifer Zone: Upper Tehama



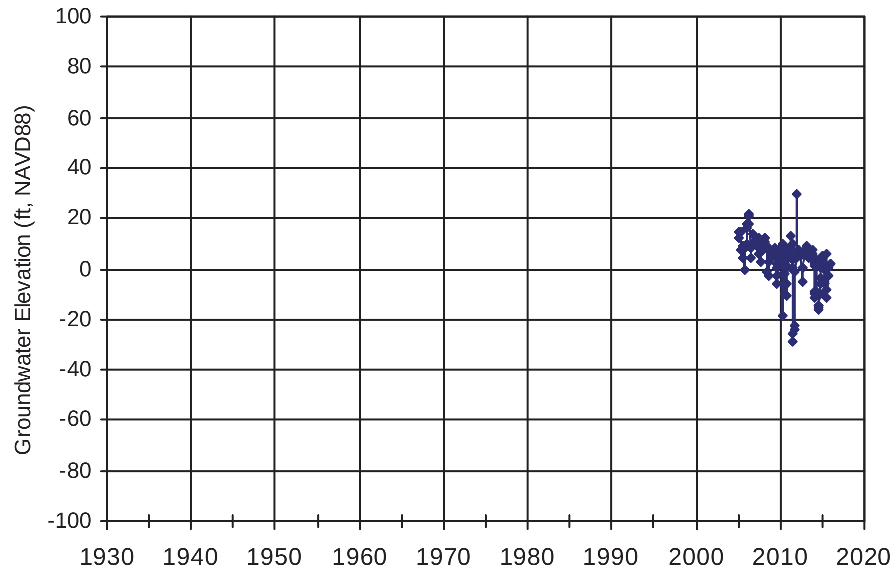

WellID: **07N01W33J002M** Source: DWR RPE: 133.12 ft, NAVD88

Aquifer Zone: Upper Tehama

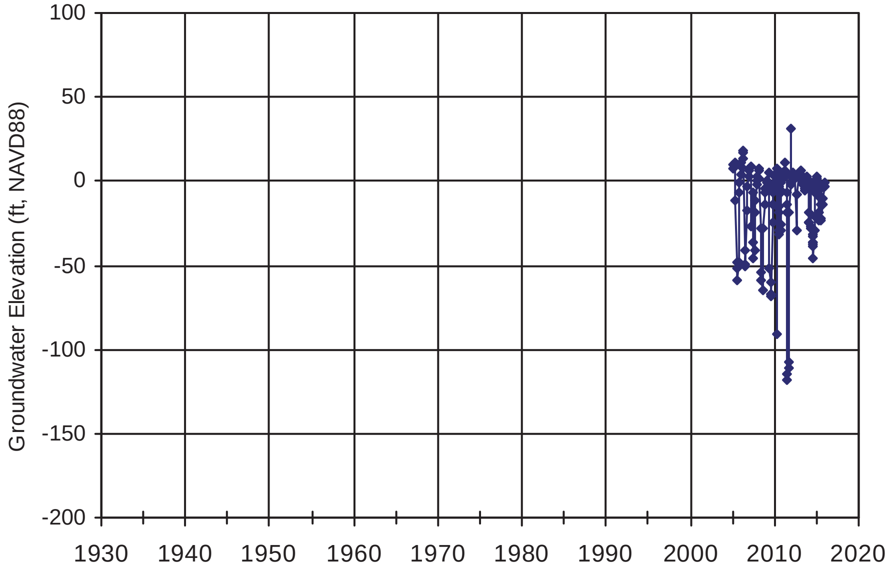



WellID: **07N02E35D002M** Source: DWR RPE: 34.29 ft, NAVD88

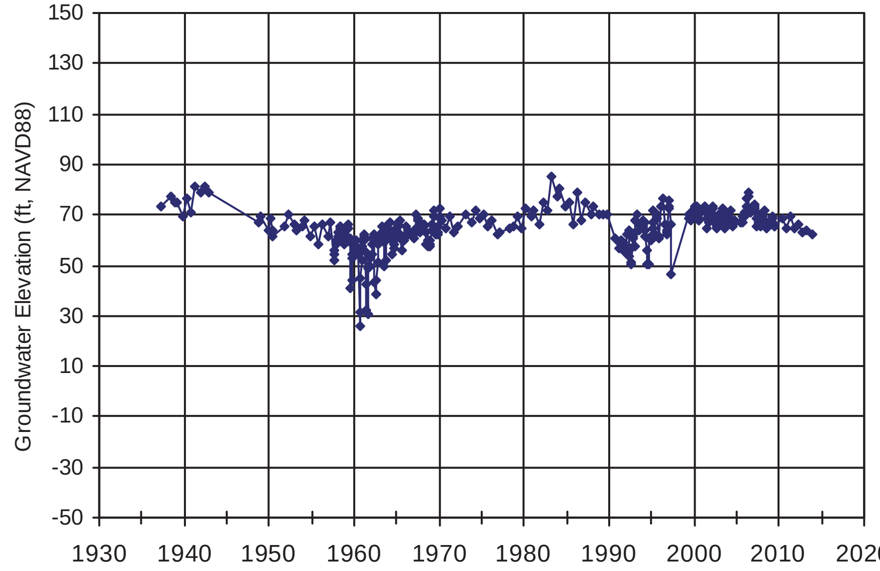
Aquifer Zone: Upper Tehama



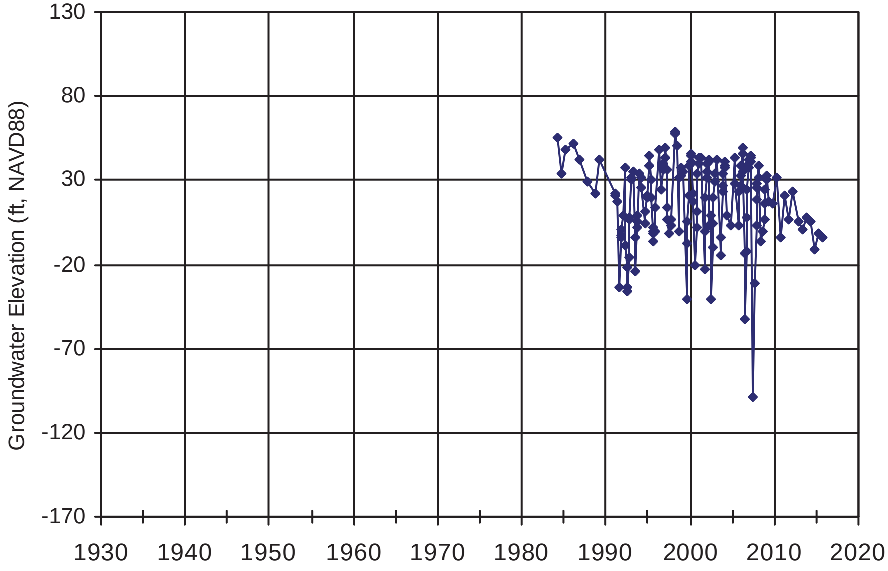
WellID: **07N02E35D003M** Source: DWR RPE: 35.15 ft, NAVD88
Aquifer Zone: Upper Tehama



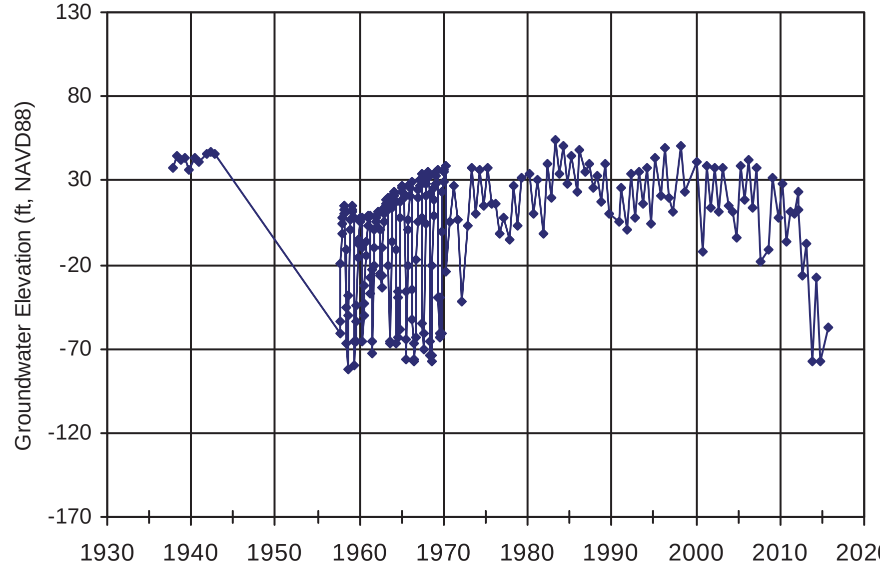

WellID: **08N01E19K001M** Source: DWR RPE: 107.08 ft, NAVD88
Aquifer Zone: Upper Tehama




WellID: **08N01E25N001M** Source: DWR RPE: 75.55 ft, NAVD88
Aquifer Zone: Upper Tehama

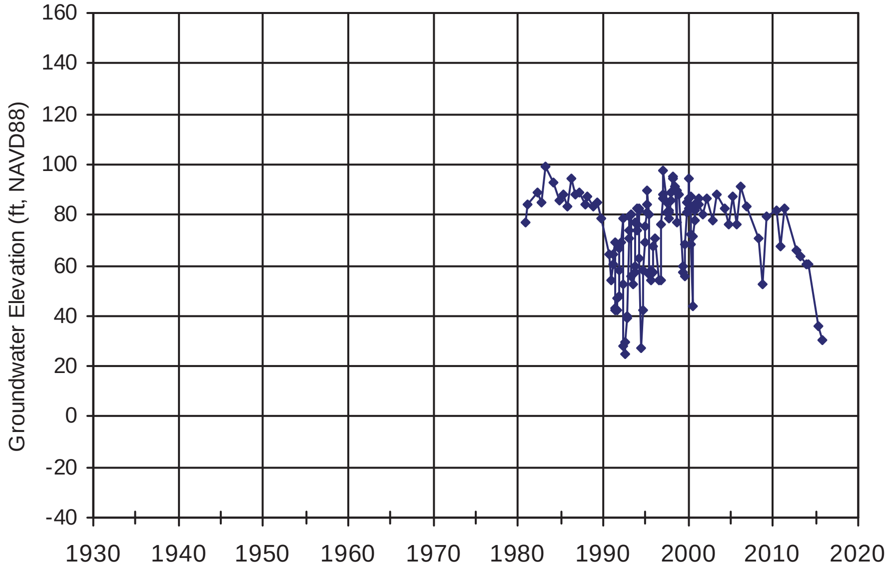



WellID: **08N01E35K001M** Source: DWR RPE: 72.3 ft, NAVD88
Aquifer Zone: Upper Tehama



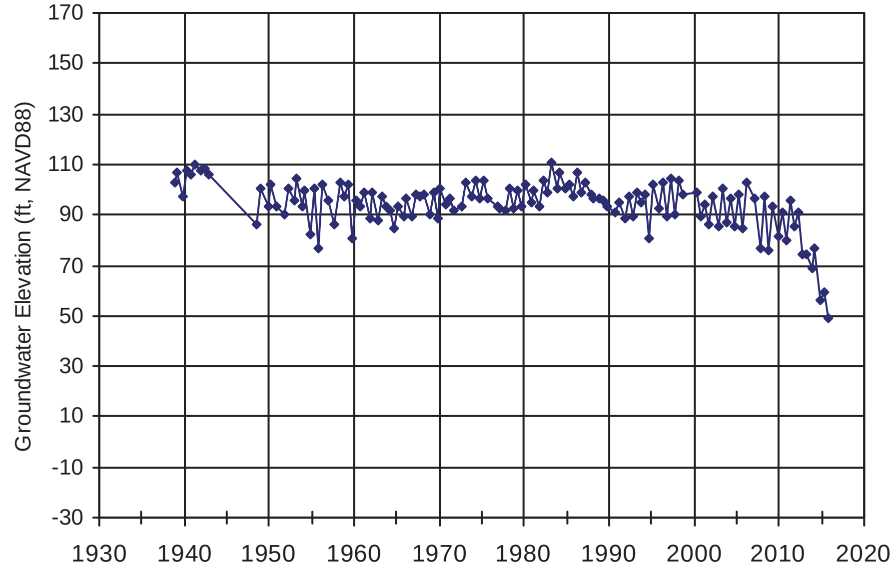
WellID: **08N01W24D001M** Source: DWR RPE: 120.6 ft, NAVD88

Aquifer Zone: Upper Tehama



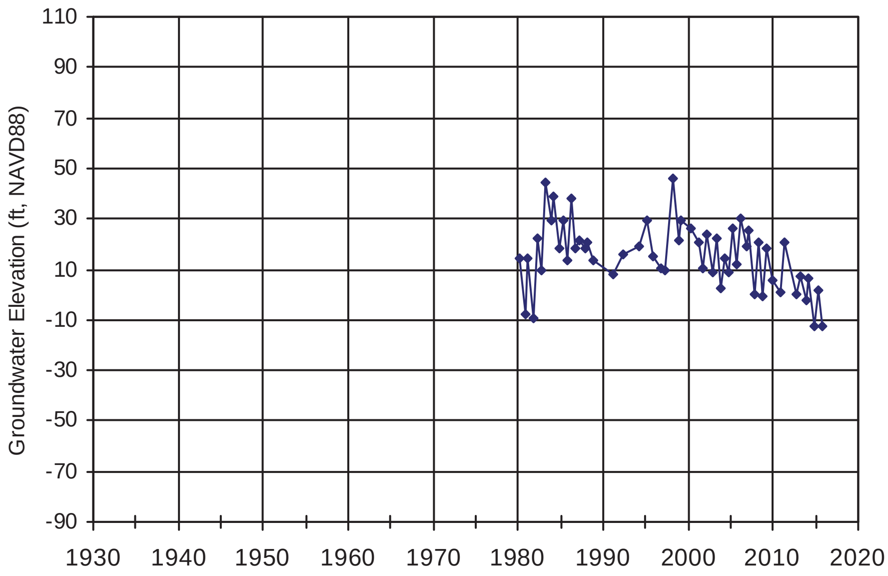

WellID: **08N01W33B002M** Source: DWR RPE: 139.1 ft, NAVD88

Aquifer Zone: Upper Tehama



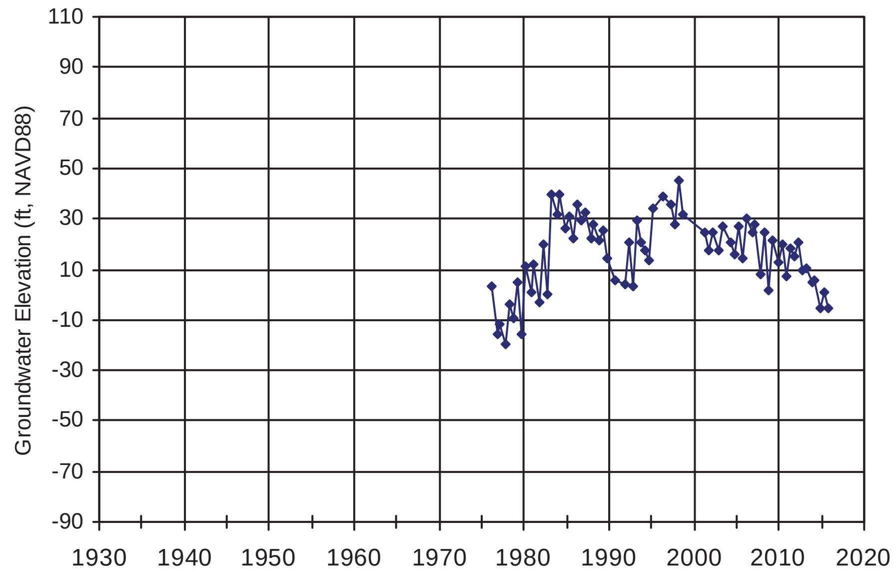

WellID: **08N02E21L001M** Source: DWR RPE: 62.4 ft, NAVD88

Aquifer Zone: Upper Tehama



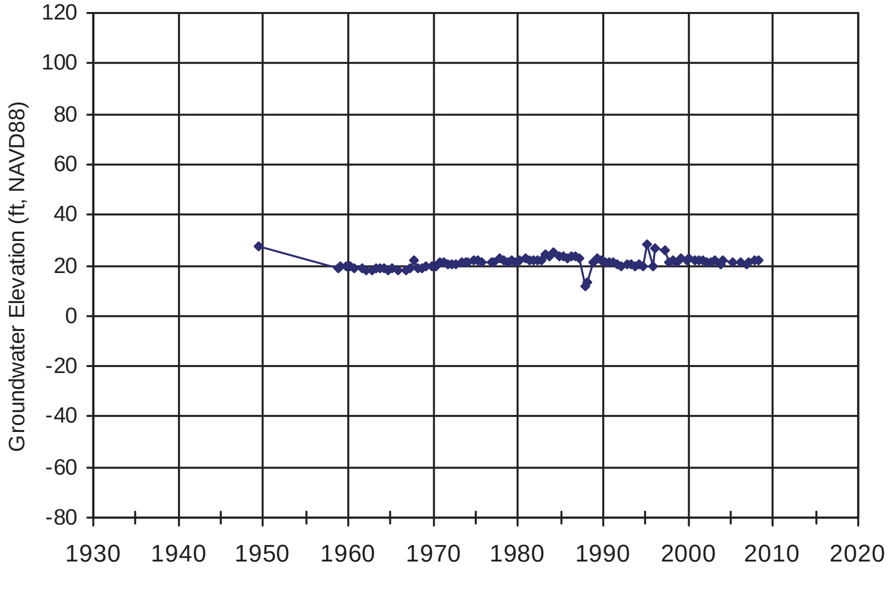

WellID: **08N02E32N001M** Source: DWR RPE: 60.55 ft, NAVD88

Aquifer Zone: Upper Tehama



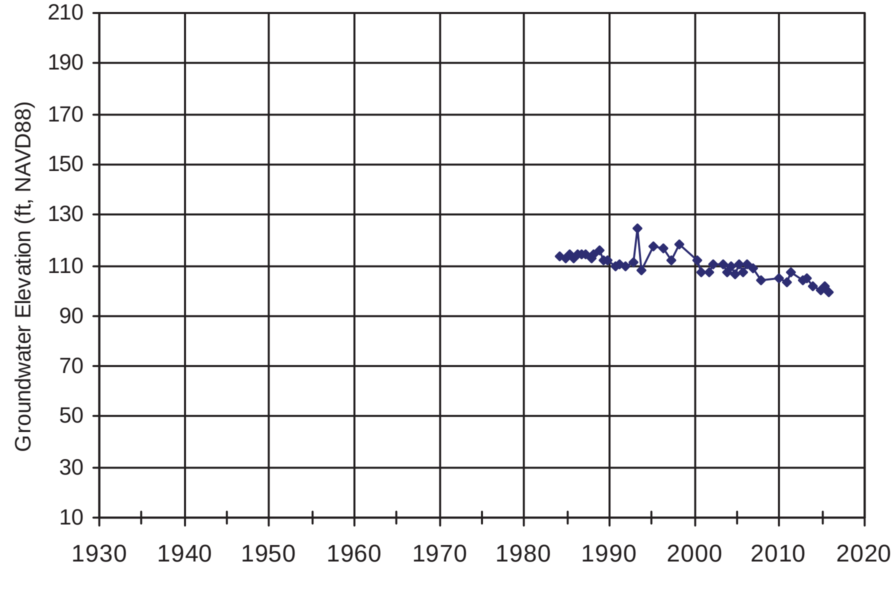
WellID: **04N02E09A001M** Source: DWR RPE: 41.67 ft, NAVD88

Aquifer Zone: Upper Tehama (possible)



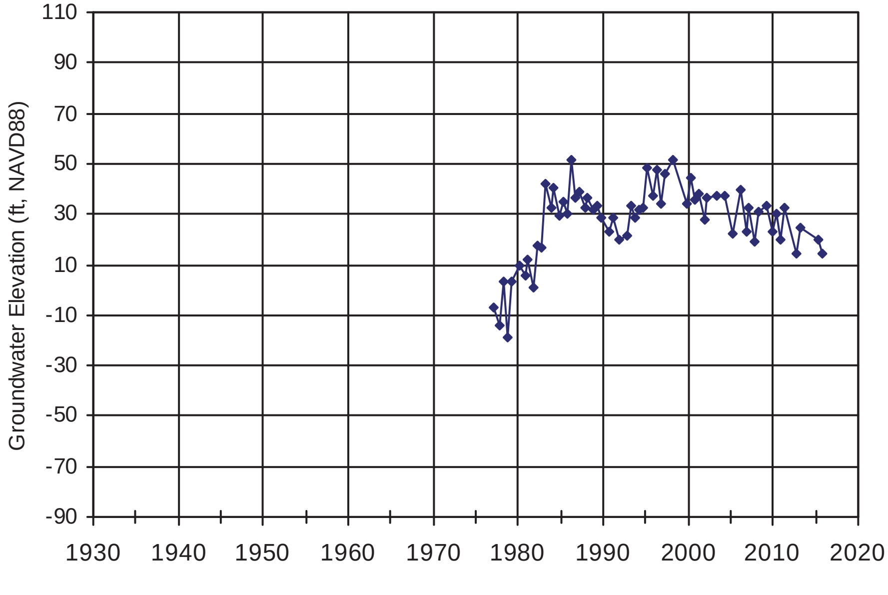

WellID: **07N01W15L001M** Source: DWR RPE: 133.1 ft, NAVD88

Aquifer Zone: Upper Tehama (possible)



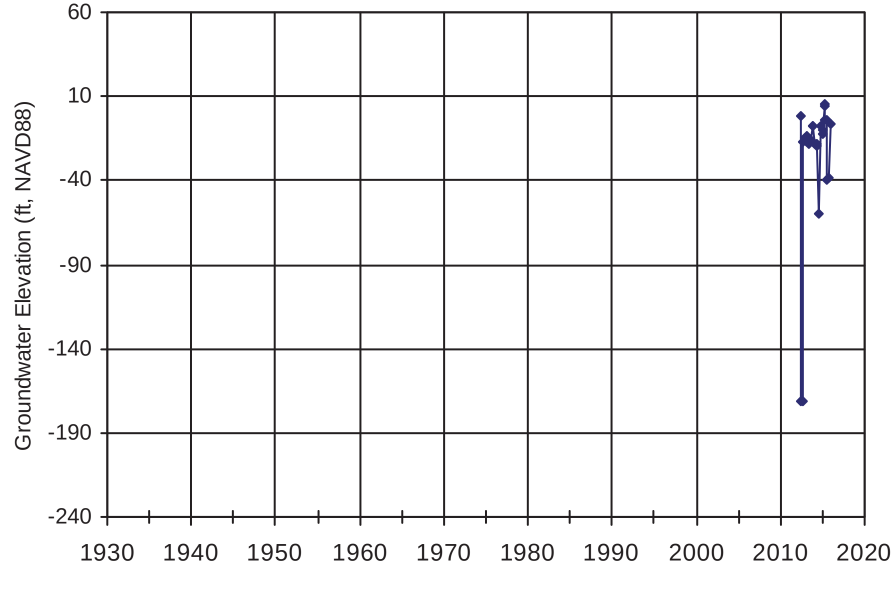

WellID: **07N02E17E002M** Source: DWR RPE: 54.6 ft, NAVD88

Aquifer Zone: Upper Tehama (possible)



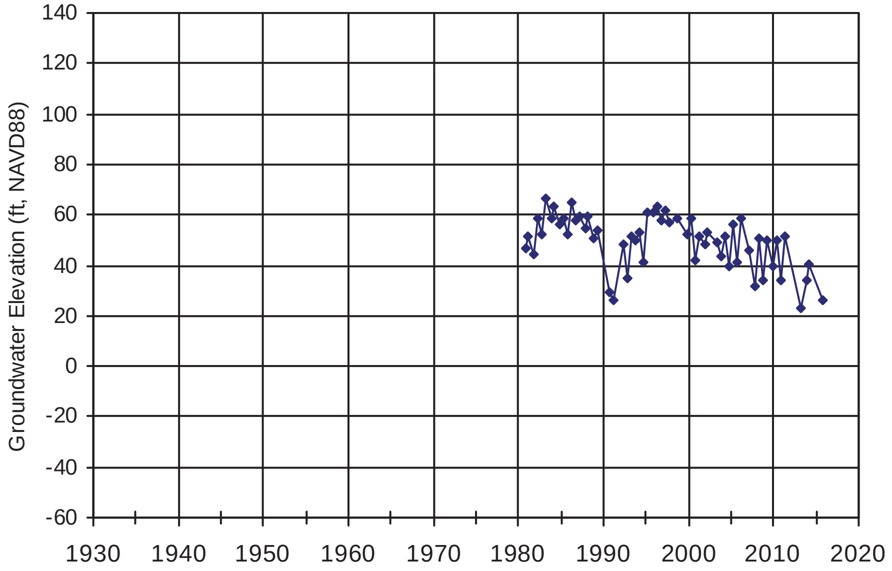

WellID: **07N01E14J002M** Source: CalWater RPE: 62 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Middle Tehama



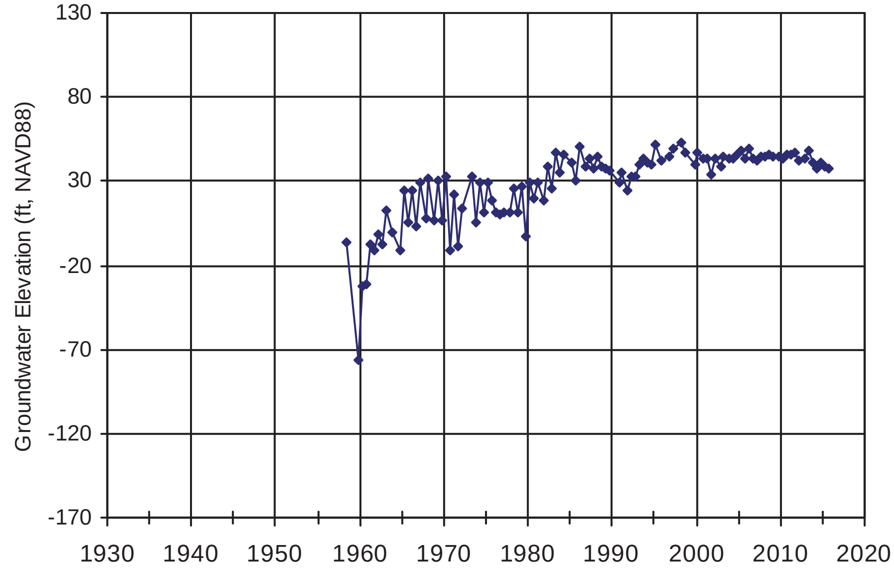
WellID: **07N01E16B002M** Source: DWR RPE: 77.6 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium



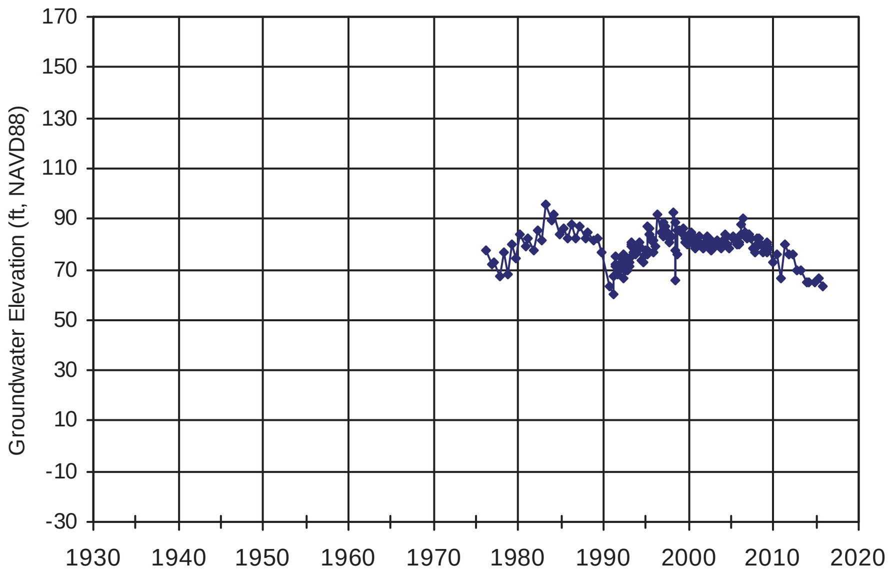

WellID: **07N01E26Q002M** Source: DWR RPE: 58.07 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium



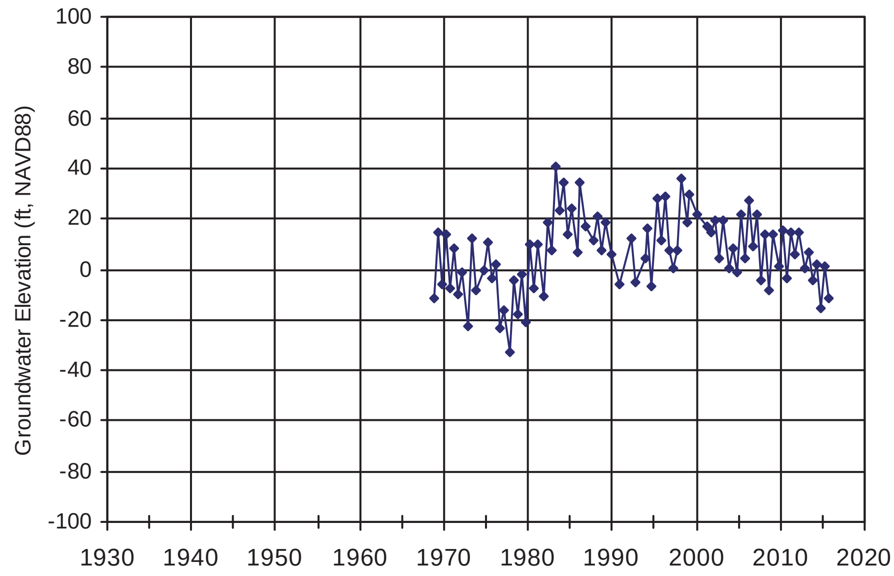

WellID: **08N01W26A002M** Source: DWR RPE: 124.59 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium



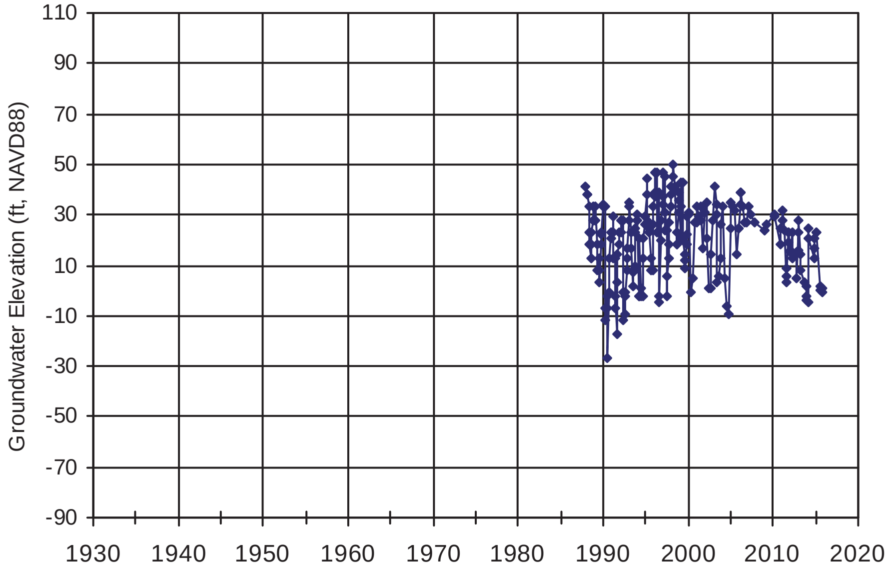

WellID: **08N02E27C002M** Source: DWR RPE: 54.5 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium



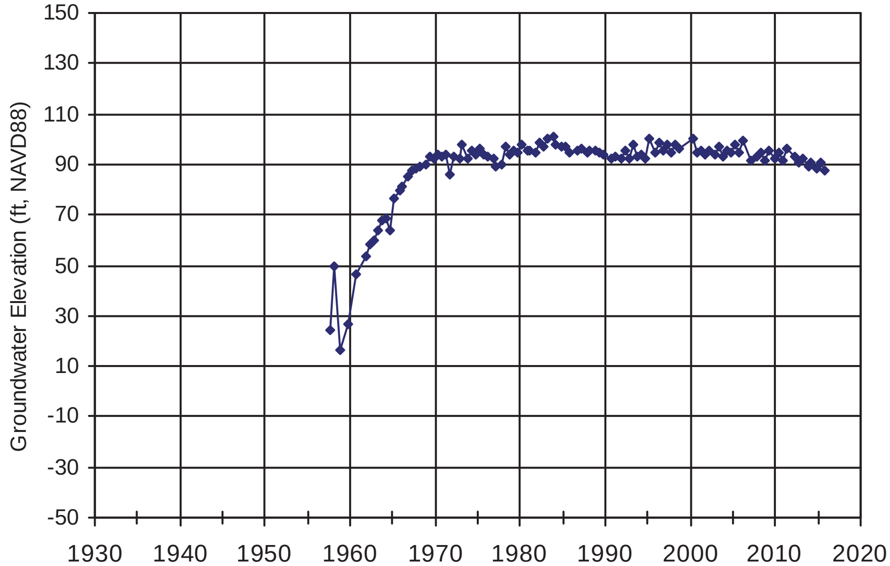
WellID: **07N01E23G002M** Source: CalWater RPE: 63 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium (possible)



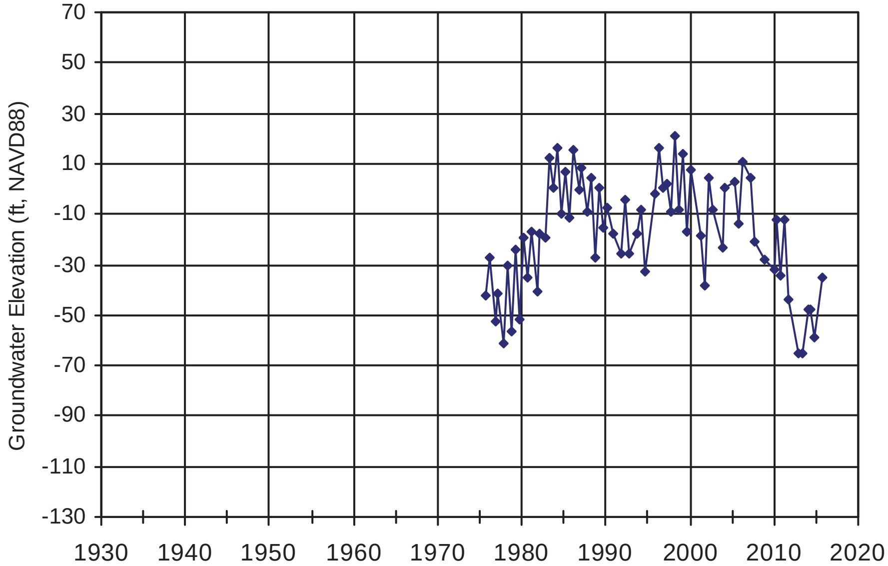

WellID: **07N01W13H001M** Source: DWR RPE: 108.6 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium (possible)



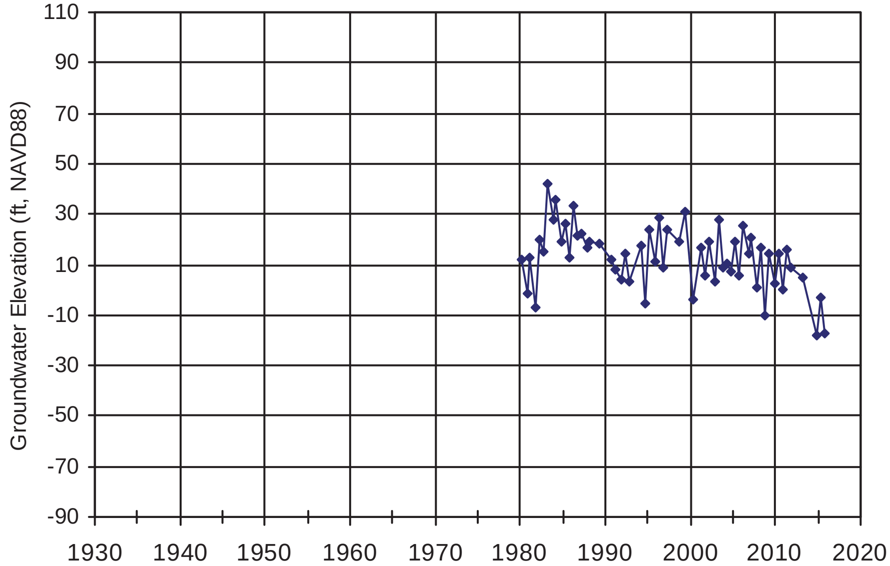

WellID: **07N02E02F002M** Source: DWR RPE: 36.04 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium (possible)




WellID: **08N02E20G001M** Source: DWR RPE: 62.05 ft, NAVD88

Aquifer Zone: Upper Tehama (primary) & Quaternary Alluvium (possible)



# APPENDIX D

Appendix D Summary Table of Solano County Groundwater Quality-Select Constituents

| | Well ID | Zone[1] | Total Dissolved Solids | | | | Nitrate (as Nitrogen) | | | | Arsenic | | | | Chromium VI | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) |
| ALAMO BUNGALOWS | WELL 01 | unknown | 12/5/1994 | 1 | 660 | 660 | 12/05/1994 | 1 | 0.4 | 0 | 12/05/1994 | 1 | <2 | <2 | | | | |
| ALDEA INC | ALDEA WELL - INACTIVE | unknown | 7/6/1989 - 8/9/2000 | 4 | 300 - 540 | 463 | 07/06/1989 - 02/05/2001 | 10 | 4.1 - 20 | 13 | 12/21/1995 - 08/09/2000 | 2 | ND - 2 | 2 | | | | |
| BIRDS LANDING HUNTING PRESERVE | WELL 01 | unknown | 11/3/1999 | 1 | 640 | 640 | 05/12/1999 - 10/28/2015 | 15 | ND - 18 | 3 | | | | | | | | |
| BUTTON TRANSPORTATION | WELL 01 | unknown | | | | | 04/13/1999 - 02/24/2012 | 28 | 2.9 - 68 | 9 | | | | | | | | |
| CADENASSO WINERY | WELL 01 - INACATIVE | unknown | | | | | 09/22/1999 | 1 | ND | ND | | | | | | | | |
| CAL YEE FARMS | WELL 01 | unknown | 12/21/1995 | 1 | 490 | 490 | 12/21/1995 - 04/10/2002 | 7 | 5.4 - 14 | 8 | 12/21/1995 | 1 | <2 | <2 | | | | |
| CALIFORNIA WATER SERVICE CO. - DIXON | WELL 01-02 - INACTIVE | unknown | 4/21/1987 - 8/5/1990 | 2 | 506 - 705 | 606 | 04/21/1987 - 08/05/1990 | 2 | 7.9 - 14 | 11 | 04/21/1987 - 08/05/1990 | 2 | <5 - <10 | <10 | | | | |
| | WELL 01-03 | unknown | 3/3/1994 - 2/11/2015 | 8 | 360 - 475 | 406 | 03/03/1994 - 11/03/2015 | 86 | 3.2 - 8.8 | 5 | 01/28/2002 - 02/09/2009 | 13 | ND - 3 | 1.9 | 01/23/2001 - 11/03/2015 | 21 | 13 - 20 | 16 |
| | WELL 02-01 | unknown | 4/20/1987 - 5/20/2014 | 11 | 462 - 613 | 519 | 04/20/1987 - 03/31/2015 | 300 | 3.4 - 12 | 8 | 11/12/2001 - 05/06/2008 | 15 | ND - 3 | 2.2 | 07/15/2002 - 01/01/2015 | 9 | 22 - 25 | 23.6 |
| | WELL 03-01 | unknown | 6/20/1988 - 12/26/2012 | 9 | 443 - 551 | 498 | 06/20/1988 - 12/16/2015 | 211 | 1.6 - 15 | 8 | 04/30/1991 - 04/07/2009 | 13 | ND - 18 | 4 | 01/23/2001 - 12/30/2014 | 5 | 22 - 24 | 23 |
| | WELL 04-01 | unknown | 6/20/1988 - 5/11/2015 | 10 | 410 - 1200 | 525 | 06/20/1988 - 05/11/2015 | 75 | ND - 9.9 | 7 | 04/18/2000 - 08/19/2014 | 15 | ND - 5.2 | 2.1 | 01/23/2001 - 06/11/2015 | 9 | 17 - 20 | 18.8 |
| | WELL 05-01 | unknown | 6/20/1988 - 2/11/2015 | 10 | 333 - 460 | 369 | 06/20/1988 - 05/19/2015 | 308 | 2.1 - 11 | 6 | 06/06/2000 - 06/20/2006 | 14 | ND - 2.3 | 2 | 01/23/2001 - 01/01/2015 | 11 | 14 - 23 | 19.5 |
| | WELL 06-01 | unknown | 3/6/1989 - 11/20/2013 | 9 | 379 - 446 | 410 | 03/06/1989 - 06/08/2015 | 68 | 1.4 - 8.9 | 6 | 12/01/1998 - 06/08/2015 | 56 | ND - 3 | 1.6 | 01/24/2001 - 06/11/2015 | 10 | 17 - 18 | 17.1 |
| | WELL 07-01 | unknown | 3/6/1989 - 3/18/2013 | 9 | 248 - 349 | 311 | 03/06/1989 - 05/11/2015 | 54 | 1.4 - 5.5 | 3 | 03/03/1998 - 03/04/2010 | 14 | ND - 3 | 2.6 | 01/24/2001 - 06/11/2015 | 12 | 16 - 20 | 17.7 |
| | WELL 08-01 | unknown | 3/6/1989 - 3/20/2013 | 9 | 319 - 459 | 385 | 03/06/1989 - 03/31/2015 | 51 | 1.1 - 6.6 | 3 | 03/03/1998 - 03/20/2013 | 13 | ND - 4 | 2.9 | 01/24/2001 - 04/07/2015 | 8 | 11 - 18 | 14.9 |
| | WELL 09 | unknown | 10/4/2010 - 9/11/2013 | 2 | 320 - 360 | 340 | 10/04/2010 - 11/03/2015 | 18 | 0.9 - 3.5 | 3 | 10/04/2010 - 10/04/2010 | 2 | ND - 3.4 | 3.4 | 10/04/2010 - 11/09/2015 | 15 | ND - 24 | 20.9 |
| CAMPBELL RANCH | WELL 01 | unknown | 7/13/2006 | 1 | 460 | 460 | 10/07/1998 - 12/23/2014 | 25 | ND - 3.4 | 1 | 07/13/2006 | 1 | ND | ND | | | | |
| CAMPBELL SOUP SUPPLY CO - DIXON CANNING | DOMESTIC WELL | unknown | 11/6/2003 - 6/7/2012 | 6 | 360 - 480 | 420 | 12/20/1999 - 09/03/2015 | 38 | 1.2 - 8.1 | 5 | 10/28/2004 - 06/11/2015 | 6 | 2.2 - 3.6 | 2.6 | 12/01/2014 - 11/19/2015 | 6 | 17 - 31 | 23.5 |
| CITY OF DIXON | WELL 37 | unknown | 7/16/1990 - 4/4/2012 | 15 | 340 - 380 | 359 | 07/12/1989 - 06/26/2015 | 47 | 2.1 - 5.2 | 4 | 07/29/1998 - 05/11/2006 | 6 | 1.8 - 2.6 | 2.1 | 05/22/2001 - 06/26/2015 | 8 | 7.8 - 20 | 15.2 |
| | WELL 44 | unknown | 7/9/1990 - 4/4/2012 | 16 | 310 - 450 | 360 | 07/02/1989 - 06/26/2015 | 120 | 1.6 - 8.6 | 5 | 07/27/1995 - 05/11/2006 | 10 | 1.9 - 3 | 2.3 | 05/17/2001 - 06/26/2015 | 8 | 14 - 25.6 | 22.1 |
| | WELL 48 | unknown | 7/30/1991 - 4/4/2012 | 16 | 260 - 353 | 306 | 07/30/1991 - 06/26/2015 | 38 | 0.8 - 4.1 | 2 | 07/27/1995 - 04/04/2012 | 13 | 2 - 3.2 | 2.5 | 05/17/2001 - 06/26/2015 | 8 | 11 - 19.5 | 16 |
| | WELL 52 | unknown | 4/16/2003 - 4/5/2012 | 6 | 312 - 470 | 396 | 04/16/2003 - 06/26/2015 | 49 | 0.5 - 9.5 | 6 | 04/16/2003 - 05/11/2006 | 3 | 2.6 - 3.4 | 2.9 | 02/24/2004 - 06/26/2015 | 5 | 5 - 20 | 14 |
| | WELL 54 | unknown | 12/12/2006 - 4/5/2012 | 3 | 302 - 360 | 334 | 12/12/2006 - 06/26/2015 | 12 | 0.6 - 1 | 1 | 12/12/2006 - 04/05/2012 | 3 | 2.2 - 2.8 | 2.4 | 12/18/2014 - 06/26/2015 | 4 | 14 - 27 | 21.3 |
| CITY OF RIO VISTA | WELL 07 | unknown | 7/29/1987 - 10/5/2015 | 37 | 270 - 502 | 412 | 07/29/1987 - 12/02/2013 | 44 | ND - 4.5 | 2 | 03/09/1993 - 11/03/2015 | 101 | 5 - 11 | 8.3 | 01/21/2014 - 06/16/2014 | 2 | <0.05 - 1.1 | 1.1 |
| | WELL 08 | unknown | 7/29/1987 - 10/6/2009 | 10 | 450 - 850 | 731 | 07/29/1987 - 09/08/2009 | 36 | ND - 3.5 | 2 | 03/09/1993 - 11/02/2009 | 28 | 5.6 - 15 | 8.6 | 01/21/2014 - 06/16/2014 | 2 | 0.62 - 1.5 | 1.1 |
| | WELL 09 | unknown | 7/29/1987 - 10/5/2015 | 29 | 360 - 450 | 412 | 07/29/1987 - 09/11/2006 | 28 | ND - 7.4 | 2 | 03/09/1993 - 11/03/2015 | 89 | 5 - 14 | 8 | | | | |
| | WELL 10 | unknown | 11/28/1989 - 7/7/2014 | 22 | 360 - 450 | 417 | 11/28/1989 - 12/02/2013 | 42 | ND - 3.2 | 2 | 11/28/1989 - 09/29/2015 | 78 | 8 - 22 | 16.3 | 06/16/2014 | 1 | <0.05 | <0.05 |
| | WELL 11 | unknown | 9/11/1995 - 10/5/2015 | 30 | 390 - 510 | 445 | 09/11/1995 - 03/06/2015 | 46 | ND - 3.2 | 2 | 09/11/1995 - 11/03/2015 | 27 | 5 - 13 | 7.2 | 01/21/2014 - 06/16/2014 | 2 | 1.36 - 2.21 | 1.8 |
| | WELL 12 | unknown | 10/24/1995 - 1/4/2010 | 5 | 434 - 490 | 455 | 10/24/1995 - 12/08/2009 | 30 | ND - 1.9 | 1 | 10/24/1995 - 02/25/2009 | 16 | 5 - 17 | 9.1 | | | | |
| | WELL 13 | unknown | 4/15/2004 - 10/5/2015 | 29 | 420 - 530 | 455 | 04/15/2004 - 10/05/2015 | 12 | 0.5 - 2.9 | 2 | 04/15/2004 - 11/03/2015 | 95 | 6 - 11 | 9.1 | 01/21/2014 - 06/16/2014 | 2 | 1.52 - 2.99 | 2.3 |
| | WELL 14 | unknown | | | | | 03/06/2015 | 1 | 1.7 | 2 | 01/30/2015 - 11/03/2015 | 10 | 3 - 10 | 8.1 | | | | |
| | WELL 15 | unknown | | | | | 03/06/2015 | 1 | 0.5 | 1 | 01/30/2015 - 11/03/2015 | 10 | 7 - 9 | 8.2 | | | | |
| CITY OF VACAVILLE | DE MELLO WELL - STANDBY | UT | 12/5/2002 - 1/12/2011 | 4 | 270 - 296 | 282 | 12/05/2002 - 01/31/2012 | 10 | ND - 0.6 | 0 | 12/05/2002 | 1 | 2 | 2 | 12/05/2002 | 1 | ND | ND |
| | WELL 01 | MARK | 2/18/1987 - 6/18/2014 | 8 | 500 - 546 | 532 | 02/18/1987 - 05/12/2015 | 16 | 2.5 - 3 | 3 | 04/29/1999 - 03/07/2002 | 2 | 2.1 - 2.6 | 2.3 | 05/17/2001 - 11/05/2014 | 3 | 1.5 - 1.7 | 1.6 |
| | WELL 02 | BT | 2/18/1987 - 1/21/2014 | 9 | 310 - 460 | 377 | 02/18/1987 - 01/01/2015 | 18 | 1.8 - 5.2 | 3 | 06/03/1999 - 03/16/2005 | 3 | 1.9 - 3 | 2.3 | 05/17/2001 - 01/01/2015 | 3 | 4.2 - 4.7 | 4.4 |
| | WELL 03 | BT | 3/30/1987 - 1/21/2014 | 9 | 300 - 390 | 338 | 03/30/1987 - 01/01/2015 | 19 | ND - 3 | 2 | 01/26/1995 - 01/12/2011 | 6 | 2 - 3.1 | 2.5 | 05/17/2001 - 12/15/2015 | 6 | 14 - 16 | 15.1 |
| | WELL 04 - DESTROYED | unk | 3/25/1986 - 2/22/1989 | 2 | 330 - 332 | 331 | 02/25/1986 - 02/22/1989 | 2 | 0.4 - 1.6 | 1 | 02/25/1986 - 02/22/1989 | 2 | <4 | <4 | | | | |
| | WELL 05 | BT | 2/25/1986 - 1/21/2014 | 10 | 380 - 480 | 432 | 02/25/1986 - 01/01/2015 | 19 | ND - 4.6 | 4 | 01/26/1995 - 03/07/2002 | 3 | 1.6 - 2 | 1.9 | 05/17/2001 - 01/01/2015 | 3 | 2.9 - 4.1 | 3.4 |
| | WELL 06 | BT | 3/16/1988 - 1/21/2014 | 8 | 340 - 390 | 364 | 03/16/1988 - 05/12/2015 | 17 | 1.4 - 2.4 | 2 | 04/29/1999 - 02/16/2011 | 5 | 1.9 - 3 | 2.4 | 05/17/2001 - 10/20/2014 | 3 | ND - 11.2 | 10.5 |
| | WELL 07 | BT | 3/16/1988 - 1/30/2008 | 6 | 350 - 384 | 366 | 03/16/1988 - 01/30/2008 | 11 | 0.9 - 1.1 | 1 | 08/02/1994 - 01/30/2008 | 5 | 3.1 - 4.1 | 3.7 | 05/17/2001 - 03/14/2002 | 2 | 8.5 - 9.5 | 9 |
| | WELL 08 | BT | 3/16/1988 - 1/21/2014 | 9 | 270 - 430 | 357 | 03/16/1988 - 01/12/2015 | 19 | ND - 2.9 | 1 | 10/28/1999 - 01/12/2011 | 5 | 2.9 - 5.4 | 3.9 | 05/17/2001 - 01/01/2015 | 3 | 6.4 - 12.8 | 9.7 |
| | WELL 09 | BT | 1/30/1989 - 1/21/2014 | 9 | 300 - 480 | 330 | 01/30/1989 - 01/01/2015 | 18 | ND - 3.7 | 1 | 01/26/1995 - 01/12/2011 | 6 | 2 - 4.4 | 3 | 05/17/2001 - 12/15/2015 | 6 | 16 - 20.4 | 17.6 |
| | WELL 13 | BT | 6/7/1990 - 1/21/2014 | 8 | 310 - 400 | 360 | 06/07/1990 - 05/12/2015 | 17 | 1.2 - 3.6 | 3 | 04/29/1999 - 03/16/2005 | 3 | 1.9 - 2 | 2 | 05/17/2001 - 11/05/2014 | 3 | 6.8 - 7.8 | 7.5 |
| | WELL 14 | BT | 8/4/1997 - 1/21/2014 | 9 | 280 - 330 | 291 | 08/04/1997 - 01/01/2015 | 18 | ND - 0.7 | 1 | 08/04/1997 - 01/21/2014 | 9 | 2.3 - 7 | 4.9 | 05/17/2001 - 12/15/2015 | 6 | 20 - 22.2 | 20.8 |
| | WELL 15 | BT | 6/29/2004 - 1/21/2014 | 6 | 298 - 310 | 306 | 06/29/2004 - 01/01/2015 | 13 | 0.6 - 1 | 1 | 06/29/2004 - 01/21/2014 | 6 | 2.7 - 3.9 | 3.5 | 06/29/2004 - 12/15/2015 | 6 | 10.7 - 13.3 | 11.7 |
| | WELL 16 | BT | 12/28/2004 - 1/21/2014 | 6 | 290 - 350 | 310 | 12/28/2004 - 01/01/2015 | 11 | ND - 0.5 | 0 | 12/28/2004 - 12/15/2015 | 46 | 2.6 - 13 | 7.8 | 12/28/2004 - 12/15/2015 | 6 | 5.1 - 24 | 18.9 |
| | DeMello MW-95ft | QA | 7/16/2001 - 1/5/2011 | 2 | 380 - 500 | 440 | 07/16/2001 - 01/05/2011 | 2 | 3.2 - 6.1 | 4.7 | 07/16/2001 - 01/05/2011 | 2 | 2 - 3 | 2.5 | | | | |
| | MW-14 | BT | 3/25/1993 | 1 | 290 | 290 | 03/25/1993 | 1 | 0.5 | 0.5 | 03/25/1993 | 1 | <10 | <10 | | | | |
| | MW-15-188ft | QA_UT | 8/18/2000 - 1/15/2011 | 3 | 200 - 250 | 225 | 01/06/1999 | 1 | 0.8 | 0.8 | 08/18/2000 - 01/15/2011 | 3 | <2 - 1.9 | 1.6 | | | | |
| | MW-15-508ft | UT | 8/18/2000 - 1/4/2011 | 2 | 291 - 320 | 306 | 08/18/2000 - 01/15/2011 | 3 | 0.72 - 0.98 | 0.9 | 08/18/2000 - 01/04/2011 | 2 | <1 - <2 | <2 | | | | |
| | MW-15-1815ft | BT | 1/6/1999 | 1 | 277 | 277 | 08/18/2000 - 01/04/2011 | 2 | 1.1 | 1.1 | 01/06/1999 | 1 | <2 | <2 | | | | |

Appendix D Summary Table of Solano County Groundwater Quality-Select Constituents

| | | | Total Dissolved Solids | | | | Nitrate (as Nitrogen) | | | | Arsenic | | | | Chromium VI | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Well ID | Zone[1] | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) |
| CITY OF VACAVILLE | MW-16-117ft | UT | 5/29/2002 - 1/4/2011 | 3 | 250 - 272 | 261 | 05/29/2002 - 12/16/2010 | 3 | 0.25 - 0.93 | 0.6 | 05/29/2002 - 01/04/2011 | 3 | <2 - 1.6 | 1.4 | | | | |
| | MW-16-1166ft | BT | 5/29/2002 - 12/16/2010 | 3 | 280 - 330 | 307 | 05/29/2002 - 01/04/2011 | 3 | 0.25 - 1.02 | 0.6 | 05/29/2002 - 12/16/2010 | 3 | <2 - 5 | 4.8 | | | | |
| | MW-16-1430ft | BT | 11/19/2002 - 1/18/2011 | 3 | 280 - 302 | 294 | 11/19/2002 - 01/18/2011 | 3 | 0.14 - 0.56 | 0.4 | 11/19/2002 - 01/18/2011 | 3 | 1.8 - 7.4 | 3.1 | | | | |
| | MW-16-1464-1604 | BT | 9/20/2002 | 1 | 330 | 330 | 09/20/2002 | 1 | <0.23 | <0.23 | 09/20/2002 | 1 | 11 | 11 | | | | |
| | MW-17-1280ft | BT | 1/26/2011 - 3/31/2011 | 2 | 310 - 300 | 305 | 01/26/2011 - 01/26/2011 | 2 | ND - ND | ND | 01/26/2011 - 03/31/2011 | 2 | 2.6 - 2.8 | 2.7 | | | | |
| | MW-17-1360ft | BT | 1/25/2011 - 3/30/2011 | 2 | 250 - 260 | 255 | 01/25/2011 - 01/25/2011 | 2 | 0.47 - 0.5 | 0.49 | 01/25/2011 - 03/30/2011 | 2 | 2.4 - 3 | 2.7 | | | | |
| | MW-17-1470ft | BT | 1/24/2011 - 3/8/2011 | 2 | 310 - 290 | 300 | 01/24/2011 - 03/08/2011 | 2 | ND - 0.47 | 0.47 | 01/24/2011 - 03/08/2011 | 2 | 2.3 - 2.9 | 2.6 | | | | |
| | MW-93C | UNK | 12/22/1992 | 1 | 490 | 490 | 12/22/1992 | 1 | 0.7 | 0.7 | 12/22/1992 - <10 | 1 | <10 | <10 | | | | |
| | MW-98A | BT | 11/16/1988 - 1/10/2011 | 3 | 271 - 296 | 282 | 11/16/1998 - 01/10/2011 | 3 | 0.5 | 0.5 | 11/16/1998 - 01/10/2011 | 2 | <3 - 2.9 | 2.9 | | | | |
| | MW-98B | BT | 1/13/1999 | 1 | 362 | 362 | 01/13/1999 | 1 | <0.02 | <0.02 | 01/13/1999 - 01/13/1999 | 1 | 4.7 | 4.7 | | | | |
| | MW-98C | BT | 1/29/1999 - 1/12/2011 | 2 | 302 - 320 | 311 | 01/29/1999 - 01/26/2011 | 2 | <0.2 - 0.07 | 0.07 | 01/29/1999 - 01/12/2011 | 2 | <2 - 3.5 | 3.5 | | | | |
| COLLINSVILLE WATER WORKS | WELL 01 | unknown | 2/22/2000 - 5/12/2015 | 3 | 700 - 736 | 712 | 01/05/1996 - 05/12/2015 | 6 | ND - ND | 0 | 02/22/2000 - 05/12/2015 | 3 | 14 - 17 | 15.7 | 05/12/2015 | 1 | ND | ND |
| CRESTA MESA PARQUE | WELL 01 | unknown | 11/10/2000 - 2/28/2013 | 3 | 169 - 180 | 173 | 11/10/2000 - 06/23/2015 | 11 | ND - 1.8 | 1 | 02/28/2013 | 1 | 20 | 20 | | | | |
| DANA RANCH | WELL 01 | unknown | 8/26/1998 - 8/4/2014 | 6 | 670 - 800 | 742 | 05/04/1994 - 08/04/2015 | 19 | ND - 6.6 | 2 | 05/04/1994 - 11/17/2015 | 12 | 6 - 17 | 12.1 | 08/04/2015 | 1 | 5 | 5 |
| DELTA CONSERVATION CAMP | WELL 03 | unknown | 7/6/1993 - 10/9/2014 | 4 | 680 - 750 | 705 | 07/06/1993 - 10/02/2015 | 11 | ND - 3.6 | 1 | 08/07/1997 - 10/09/2014 | 6 | 5.2 - 6.1 | 5.9 | 12/02/2014 | 1 | <1 | <1 |
| DELTA INDUSTRIAL PROPERTIES | WELL 02 | unknown | 3/21/1999 | 1 | 560 | 560 | 03/21/1999 - 08/20/2006 | 7 | ND - 3.4 | 3 | 03/21/1999 | 1 | 15 | 15 | | | | |
| DIXON 76 | WELL 01 | unknown | 10/12/1999 | 1 | 760 | 760 | 04/13/1999 - 10/01/2015 | 56 | ND - 18 | 13 | | | | | | | | |
| DIXON FRUIT MARKET | WELL 01 - RAW | unknown | 4/22/2008 | 1 | 57.1 | 57 | 02/26/2003 - 04/02/2010 | 1 | ND | ND | | | | | | | | |
| DIXON HOUSING AUTHORITY | WELL 01 | unknown | 4/1/1999 - 10/2/2003 | 2 | 430 - 430 | 430 | 04/01/1999 - 11/13/2007 | 7 | ND - 3.4 | 2 | 04/01/1999 - 10/02/2003 | 2 | 3 - 4 | 3.5 | | | | |
| DIXON MIGRANT CENTER | WELL 01 | unknown | | | | | 05/26/2009 | 1 | 0.9 | 1 | | | | | 04/06/2011 - 04/26/2011 | 2 | 21 - 29 | 25 |
| | WELL 02 | unknown | | | | | 12/16/2008 - 06/29/2015 | 6 | ND - 0.8 | 1 | 07/23/2012 - 06/29/2015 | 2 | 3.1 - 3.1 | 3.1 | 04/26/2011 - 06/29/2015 | 4 | 6.9 - 11 | 9.3 |
| EB STONE | WELL 01 | unknown | 11/13/1995 - 2/15/2007 | 4 | 580 - 680 | 630 | 11/13/1995 - 06/26/2015 | 19 | 6.6 - 21 | 11 | 11/13/1995 - 02/15/2007 | 3 | 4.5 - 5.9 | 5.2 | | | | |
| EL TAPATIO CAFE | WELL 01 | unknown | 9/6/1996 | 1 | 740 | 740 | 09/06/1996 - 12/11/2015 | 16 | 1.6 - 6.1 | 4 | 09/06/1996 | 1 | 4 | 4 | | | | |
| FAITH BAPTIST CHURCH | WELL 01 | unknown | | | | | 04/02/2007 - 12/03/2008 | 2 | 4.7 - 5.4 | 5 | | | | | | | | |
| FRED FINCH YOUTH CENTER | WELL 01 | unknown | 12/9/1994 - 3/21/2003 | 3 | 360 - 480 | 420 | 12/09/1994 - 05/11/2010 | 43 | ND - 15 | 9 | 12/09/1994 - 03/31/2003 | 3 | 1.7 - 2.6 | 2.1 | | | | |
| GEORGE S ORANGE/MR. TACO | WELL 01 | unknown | | | | | 12/29/2000 - 06/29/2005 | 9 | 2.4 - 11 | 6 | | | | | | | | |
| GILL SIDHU CHEVRON | WELL 01 | unknown | | | | | 04/05/2006 - 09/04/2015 | 48 | 1.3 - 15 | 9 | 04/05/2006 | 1 | 2.4 | 2.4 | | | | |
| GLASHOFF'S FRUIT STAND | WELL 01 | unknown | 10/13/1999 | 1 | 740 | 740 | 05/12/1999 - 10/09/2000 | 3 | 0.5 - 4.1 | 3 | | | | | | | | |
| HANSEN ROOFING TILE | WELL 01 - RAW | unknown | 10/12/2005 | 1 | 300 | 300 | 01/11/1999 - 02/08/2007 | 6 | 1.8 - 18 | 7 | 10/12/2005 | 1 | 4 | 4 | | | | |
| HARRIS MORAN SEED COMPANY | WELL 01 | unknown | 12/19/2000 - 5/12/2009 | 3 | 279 - 532 | 444 | 12/19/2000 - 11/03/2015 | 32 | ND - 12 | 6 | 12/19/2000 - 05/05/2015 | 2 | 4 - 4.2 | 4.1 | | | | |
| HASTINGS ISLAND HUNTING PRESERVE | WELL 01 | unknown | | | | | 05/12/1999 - 09/10/2013 | 10 | ND - ND | ND | 02/09/2005 | 1 | ND | ND | | | | |
| HICKORY PIT | WELL 01 - INACTIVE | unknown | 11/2/1999 | 1 | 260 - 260 | 260 | 10/11/1995 - 11/13/2002 | 6 | ND - 1.8 | 2 | | | | | | | | |
| HIDDEN ACRES TRAILER VILLA | MAIN WELL | unknown | 10/11/1999 - 6/4/2014 | 5 | 420 - 540 | 478 | 07/24/1996 - 07/13/2015 | 13 | ND - 2 | 1 | 10/11/1999 | 1 | 4 | 4 | 12/15/2014 | 1 | ND | ND |
| | WELL 01 | unknown | 10/11/1999 - 6/4/2014 | 2 | 430 - 430 | 430 | 10/11/1999 - 07/13/2015 | 7 | ND - 1.9 | 1 | 06/04/2014 | 1 | ND | ND | 12/15/2014 | 1 | ND | ND |
| | WELL 02 | unknown | 10/11/1999 | 1 | 440 | 440 | 10/11/1999 - 03/03/2005 | 3 | 0.5 - 1.9 | 1 | | | | | | | | |
| HINES NURSERIES WINTERS NORTH | WINTERS NORTH DOMESTIC WELL | unknown | 10/12/1999 - 8/22/2006 | 5 | 230 - 320 | 276 | 10/12/1999 - 09/29/2015 | 15 | ND - 4.1 | 3 | 08/11/2003 - 09/04/2009 | 3 | 2.7 - 3.3 | 3.1 | 12/05/2000 - 06/23/2015 | 3 | 9.1 - 13 | 10.7 |
| HINES NURSERY WINTERS SOUTH | WELL 01 | unknown | 6/23/2005 - 10/21/2008 | 2 | 220 - 220 | 220 | 06/23/2005 - 09/29/2015 | 11 | 2.1 - 6.8 | 4 | 06/23/2005 - 08/30/2012 | 3 | ND - <2 | <2 | 06/23/2015 - 09/29/2015 | 2 | 9.6 - 15 | 12.3 |
| HUNTER HILL REST AREA | WELL 01 | unknown | 11/2/1999 | 1 | 530 | 530 | 12/15/1995 - 10/30/2014 | 19 | 1.1 - 4.3 | 2 | | | | | | | | |
| JT RANCH | WELL 01 | unknown | | | | | 11/14/2001 - 06/09/2014 | 13 | ND - 2.7 | 1 | | | | | | | | |
| LAKE SOLANO PARK | CAMPGROUND WELL - INACTIVE | unknown | | | | | 08/05/1997 - 09/30/2008 | 7 | ND - 1.5 | 1 | | | | | | | | |
| | PICNIC AREA WELL | unknown | | | | | 11/10/1999 - 09/26/2013 | 8 | ND - 1 | 1 | | | | | | | | |
| | YOUTH AREA WELL | unknown | | | | | 08/05/1997 - 02/24/2014 | 16 | ND - 0.7 | 1 | | | | | | | | |
| LAKE SOLANO PICNIC AREA | WELL 01 - INACTIVE | unknown | | | | | 07/26/1995 - 11/30/2000 | 3 | 0.8 - 1.2 | 1 | | | | | | | | |
| LEDGEWOOD CREEK WINERY | PEABODY WELL 05 | unknown | | | | | 08/04/2004 - 06/20/2014 | 9 | ND - ND | ND | | | | | | | | |
| MARIANI PACKING COMPANY, INC. | WELL 03 - ABANDONED | unknown | | | | | 07/01/1997 - 09/14/2006 | 2 | 0.7 - 1.6 | 1 | | | | | | | | |
| | WELL 04 - INACTIVE | unknown | | | | | 07/01/1997 - 12/13/2005 | 4 | 0.9 - 4.5 | 2 | | | | | | | | |
| | WELL 05 | unknown | 7/1/1997 - 6/22/2004 | 2 | 300 - 310 | 305 | 12/21/1994 - 09/29/2015 | 15 | ND - 4.1 | 1 | 12/13/1995 - 08/12/2013 | 5 | 2.2 - 4 | 3.2 | 09/10/2014 - 09/25/2014 | 2 | 8.7 - 12 | 10.35 |
| | WELL 06 | unknown | 38160 | 1 | 320 | 320 | 07/01/1997 - 09/29/2015 | 14 | ND - 2.7 | 1 | 06/22/2004 - 06/03/2010 | 2 | 2.5 - 3 | 2.8 | 09/10/2014 - 09/25/2014 | 2 | 10 - 21 | 15.5 |
| MARTIN'S METAL FABRICATION | WELL 01 | unknown | | | | | 11/13/2002 - 02/24/2014 | 13 | 3.8 - 12 | 6 | | | | | | | | |

Appendix D Summary Table of Solano County Groundwater Quality-Select Constituents

| | | | Total Dissolved Solids | | | | Nitrate (as Nitrogen) | | | | Arsenic | | | | Chromium VI | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Well ID | Zone[1] | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) |
| MIDWAY FOODS | WELL 01 | unknown | 6/8/1999 | 1 | 270 | 270 | 02/01/1996 - 05/06/2015 | 18 | ND - 3.2 | 1 | 06/08/1999 | 1 | ND | ND | | | | |
| MIDWAY RV PARK | WELL 01 | unknown | | | | | 12/01/1998 - 05/06/2015 | 15 | ND - 0.9 | 1 | | | | | | | | |
| NEIL'S SERVICE CENTER | WELL 01 - STANDBY | unknown | 5/11/1999 | 1 | 440 | 440 | 04/05/1999 - 11/07/2015 | 25 | ND - 14 | 6 | 05/11/1999 - 03/19/2012 | 2 | 2 - 3 | 2.5 | 08/12/2015 | 1 | 0.26 | 0.26 |
| | WELL 02 | unknown | 2/4/2003 - 8/12/2015 | 3 | 180 - 480 | 308 | 02/04/2003 - 08/12/2015 | 13 | 0 - 4.7 | 3 | 08/03/2009 - 08/14/2012 | 2 | 3 - 4 | 3.5 | 02/04/2003 - 08/12/2015 | 2 | ND - 0.15 | 0.15 |
| NEIL'S SERVICE CENTER II | WELL 02 | unknown | 4/5/1999 | 1 | 210 | 210 | 04/05/1999 - 05/18/2015 | 15 | ND - 1.6 | 2 | 04/05/1999 | 1 | ND | ND | | | | |
| NEW LIFE CHURCH | WELL 1 | unknown | | | | | 02/05/2015 | 1 | ND | ND | | | | | | | | |
| NORTH CAMPUS HIGH SCHOOL | WELL 01 | unknown | 4/26/1999 | 1 | 450 | 450 | 10/26/1994 - 10/01/2009 | 38 | 4.3 - 15 | 8 | 04/26/1999 | 1 | ND | ND | | | | |
| PEDRICK PRODUCE | WELL 01 | unknown | | | | | 01/06/1995 - 03/18/1999 | 6 | ND - 16 | 6 | | | | | | | | |
| RANCHOTEL | WELL 01 - STANDBY | unknown | | | | | 12/30/1996 - 07/25/2014 | 9 | 1.1 - 2.5 | 2 | | | | | | | | |
| | WELL 02 | unknown | | | | | 03/30/2009 - 10/26/2015 | 3 | 0.9 - 1.3 | 1 | | | | | | | | |
| RIVERBANK MOBILE HOME | WELL 01 | unknown | 8/23/1994 - 8/11/2004 | 3 | 487 - 680 | 565 | 08/23/1994 - 04/13/2005 | 4 | ND - 0.4 | 0 | 08/23/1994 - 08/11/2004 | 3 | 6.5 - 14 | 10 | 08/11/2004 | 1 | <1 | <1 |
| RURAL NORTH VACAVILLE WATER DISTRICT | WELL 01 | BT | 12/16/2004 - 11/7/2013 | 4 | 350 - 390 | 365 | 12/16/2004 - 11/12/2015 | 11 | 0.2 - 5 | 1 | 11/10/2003 - 11/12/2015 | 52 | 3.3 - 13 | 5.9 | 08/26/2004 - 08/30/2011 | 6 | 3.4 - 4.1 | 3.7 |
| | WELL 02 | BT | 12/16/2004 - 1/29/2014 | 3 | 340 - 340 | 340 | 12/16/2004 - 01/29/2014 | 6 | ND - 1.2 | 0 | 11/10/2003 - 08/20/2014 | 35 | 5 - 25 | 15.8 | 08/26/2004 - 02/23/2005 | 2 | 1.3 | 1.3 |
| | RNVWD MW-446ft | MT | 7/11/2005 | 1 | 360 | 360 | 07/11/2005 | 1 | 3.2 | 3.2 | 07/11/2005 | 1 | <2 | <2 | | | | |
| | RNVWD MW-594ft | MT | 7/11/2005 | 1 | 400 | 400 | 07/11/2005 | 1 | 5.9 | 5.9 | 07/11/2005 | 1 | <2 | <2 | | | | |
| | RNVWD MW-862ft | BT | 7/11/2005 | 1 | 380 | 380 | 07/11/2005 | 1 | 1 | 1 | 07/11/2005 | 1 | 13 | 13 | | | | |
| | RNVWD MW-1389ft | BT | 9/9/1998 - 7/6/2005 | 2 | 344 - 380 | 362 | 09/09/1998 - 07/06/2005 | 2 | 1.3 - 1.4 | 1.4 | 09/09/1998 - 07/06/2005 | 2 | 3.3 - 6.3 | 4.8 | | | | |
| RUSH RANCH OPEN SPACE | NORTH WELL | unknown | | | | | 10/02/2012 - 05/05/2015 | 5 | 0.6 - 14 | 10 | | | | | | | | |
| SAVE MART DISTRIBUTION CENTER 802 | WELL 01 | unknown | 11/20/2002 | 1 | 320 | 320 | 01/28/1998 - 03/05/2015 | 7 | 1 - 1.4 | 1 | 03/05/2015 | 1 | 2 | 2 | 11/06/2014 - 11/06/2014 | 5 | 4.1 - 5.4 | 4.9 |
| SCARLETT RANCH - FORCED TO PICME | WELL 01 - INACTIVE | unknown | 11/2/1999 | 1 | 500 | 500 | 11/02/1999 | 1 | ND | ND | | | | | | | | |
| SCHOLL RANCH - FORCED TO PICME | WELL 01 - INACTIVE | unknown | | | | | 10/09/2000 | 1 | ND | ND | | | | | | | | |
| SELF-SERVE PETROLEUM | WELL 01 | unknown | | | | | 04/01/1999 - 06/16/2015 | 6 | ND - 10.4 | 8 | | | | | | | | |
| SID - ELMIRA | SID DEEP WELL 46 | unknown | 7/21/1994 - 4/16/2014 | 15 | 340 - 530 | 440 | 07/21/1994 - 04/16/2015 | 25 | 0.1 - 4.1 | 2 | 08/03/1998 - 08/09/2000 | 2 | 1 - 1.2 | 1.1 | 05/22/2001 - 02/12/2015 | 3 | 1.2 - 2.8 | 2 |
| SID - QUAIL CANYON | SID DEEP WELL 47 | unknown | 9/23/1993 - 7/24/2014 | 15 | 260 - 380 | 312 | 09/23/1993 - 07/07/2015 | 26 | ND - 0.9 | 1 | 07/27/1999 - 08/22/2000 | 2 | 2 - 2.1 | 2 | 11/15/2000 - 02/12/2015 | 5 | ND - 3.1 | 2.3 |
| SNUG HARBOR RESORT | WELL 01 - DESTROYED | unknown | 5/22/2002 | 1 | 450 | 450 | 05/22/2002 - 05/10/2004 | 2 | ND - ND | ND | 05/22/2002 | 1 | 17 | 17 | | | | |
| | WELL 02 | unknown | 8/10/1998 - 9/14/2015 | 8 | 480 - 790 | 729 | 08/10/1998 - 11/09/2015 | 14 | ND - 0.2 | 0 | 05/22/2002 - 11/09/2015 | 22 | 9 - 12 | 10.6 | 12/08/2014 | 1 | <0.5 | <0.5 |
| | WELL DW-1R | unknown | 11/5/1999 - 9/14/2015 | 7 | 400 - 477 | 441 | 11/05/1999 - 11/09/2015 | 11 | ND - 0.2 | 0 | 11/05/1999 - 11/09/2015 | 22 | 10 - 19 | 17.4 | 12/08/2014 | 1 | <0.5 | <0.5 |
| STOCKING RANCH DEEPWELL | STOCKING RANCH DEEPWELL 39 - SID | unknown | 7/14/1993 - 5/15/2014 | 10 | 280 - 460 | 302 | 07/14/1993 - 05/07/2015 | 19 | ND - ND | ND | 07/14/1993 - 05/15/2014 | 10 | 5.1 - 8.4 | 6.8 | 05/23/2001 - 02/12/2015 | 3 | ND | ND |
| SUISUN-SOLANO WATER AUTHORITY | WELL 06 - INACTIVE | unknown | 7/10/1986 - 7/26/2001 | 12 | 350 - 490 | 443 | 07/10/1986 - 07/26/2001 | 15 | 0.7 - 2.9 | 2 | 07/10/1986 - 07/26/2001 | 12 | ND - <4 | <4 | 01/22/2001 - 07/26/2001 | 2 | ND | ND |
| SUNRISE TRAILER PARK | WELL 01 | unknown | | | | | 12/19/1997 | 1 | 8.8 | 9 | 08/23/1995 | 1 | 5 | 5 | | | | |
| SUPERIOR PACKING CO. | WELL 01 | unknown | 2/20/2009 - 11/12/2009 | 3 | 370 - 410 | 393 | 01/18/1999 - 05/18/2015 | 59 | ND - 9.9 | 6 | 01/18/1999 - 02/22/2006 | 4 | ND - <2 | <2 | | | | |
| | WELL 02 | unknown | 11/12/2009 | 1 | 620 | 620 | 01/18/1999 - 06/04/2015 | 44 | ND - 14 | 9 | 01/18/1999 - 02/22/2006 | 2 | 1.8 - 3.6 | 2.7 | | | | |
| | WELL 03 - INACTIVE | unknown | | | | | 01/18/1999 - 03/22/2000 | 2 | 5.2 - 12 | 9 | 01/18/1999 | 1 | <2 | <2 | | | | |
| TRAILER CITY | WELL 01 | unknown | 11/7/1995 | 1 | 750 | 750 | 11/07/1995 - 11/07/2002 | 7 | ND - 11 | 5 | 11/07/1995 | 1 | ND | ND | | | | |
| TRAVIS AIR FORCE BASE - DISTRIBUTION | WELL 2006 - DESTROYED | unknown | 1/14/1987 - 5/16/1990 | 2 | 397 - 422 | 410 | 01/14/1987 - 05/16/1990 | 2 | 0.4 - 0.5 | 1 | 01/14/1987 - 05/16/1990 | 2 | <10 | <10 | | | | |
| | WELL 2008 - DESTROYED | unknown | 6/12/1987 - 1/17/1995 | 4 | 340 - 457 | 379 | 06/12/1987 - 01/17/1995 | 5 | 0.1 - 1.5 | 1 | 08/31/1992 | 1 | 15 - 15 | 15 | | | | |
| | WELL 2010 - DESTROYED | unknown | 1/14/1987 - 1/17/1995 | 4 | 350 - 382 | 366 | 01/14/1987 - 01/17/1995 | 5 | ND - 0.4 | 0 | 01/14/1987 - 01/17/1995 | 4 | <5 - <10 | <10 | | | | |
| | WELL 2014 - DESTROYED | unknown | 1/14/1987 - 1/17/1995 | 4 | 420 - 505 | 461 | 01/14/1987 - 01/17/1995 | 5 | 0.3 - 9 | 3 | 08/31/1992 | 1 | 11 | 11 | | | | |
| | WELL 2029 | unknown | 11/2/1992 - 3/6/2003 | 4 | 390 - 430 | 403 | 08/31/1992 - 03/11/2011 | 14 | 0.2 - 6.6 | 2 | 06/12/2000 - 06/20/2000 | 2 | 2.4 - 2.5 | 2.5 | 07/18/2001 - 10/22/2002 | 2 | 1.7 - 2.2 | 1.95 |
| | WELL 2037 | unknown | 6/12/2000 - 3/7/2006 | 3 | 370 - 380 | 373 | 07/27/1998 - 03/24/2015 | 13 | 0.5 - 3.4 | 2 | 06/12/2000 - 06/20/2000 | 2 | 1.1 - 1.4 | 1.3 | 07/18/2001 - 11/24/2014 | 3 | 1.4 - 2.1 | 1.8 |
| | WELL 2038 | unknown | 6/12/2000 - 3/7/2006 | 3 | 370 - 390 | 377 | 07/27/1998 - 03/11/2011 | 11 | ND - 1.6 | 1 | 06/12/2000 - 06/20/2000 | 2 | 1 - 1.2 | 1.1 | 07/18/2001 - 10/22/2002 | 2 | 1.8 - 2.1 | 1.95 |
| | WELL 2040 - PENDING | unknown | 11/3/2004 - 3/7/2006 | 6 | 300 - 330 | 320 | 11/03/2004 - 03/24/2015 | 7 | 1 - 1.9 | 1 | 02/13/2006 | 1 | 2 | 2 | 11/03/2004 - 04/19/2005 | 5 | ND - 1.3 | 1.3 |
| | WELL 2041 - PENDING | unknown | 11/8/2004 - 3/7/2006 | 5 | 450 - 480 | 470 | 11/08/2004 - 03/07/2006 | 5 | 1.4 - 1.6 | 2 | 11/08/2004 - 03/29/2006 | 5 | 3.6 - 7 | 5.7 | 02/17/2005 - 09/06/2005 | 3 | ND | ND |
| TRIPLE M GRADING STATION | WELL 01 | unknown | | | | | 05/04/1998 - 11/13/2001 | 6 | ND - 17 | 12 | | | | | | | | |
| UPCO | WELL 01 | unknown | 10/26/1994 - 9/17/2014 | 7 | 369 - 430 | 404 | 10/26/1994 - 11/10/2015 | 15 | ND - 5 | 1 | 10/26/1994 - 11/10/2015 | 7 | 6 - 35 | 12.2 | 09/02/2003 - 09/22/2014 | 2 | ND - <1 | <1 |

Appendix D Summary Table of Solano County Groundwater Quality-Select Constituents

| | | | **Total Dissolved Solids** | | | | **Nitrate (as Nitrogen)** | | | | **Arsenic** | | | | **Chromium VI** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Well ID** | **Zone[1]** | **Range of Sample Dates** | **Number of Samples** | **Range of Values (mg/L)** | **Average Value (mg/L)** | **Range of Sample Dates** | **Number of Samples** | **Range of Values (mg/L)** | **Average Value (mg/L)** | **Range of Sample Dates** | **Number of Samples** | **Range of Values (ug/L)** | **Average Value (ug/L)** | **Range of Sample Dates** | **Number of Samples** | **Range of Values (ug/L)** | **Average Value (ug/L)** |
| VACA VILLA APARTMENTS | WELL 01 | unknown | 10/28/1994 - 11/4/2014 | 6 | 480 - 820 | 640 | 12/28/1994 - 02/10/2015 | 20 | ND - 2 | 1 | 12/28/1994 - 11/04/2014 | 6 | ND - <2 | <2 | | | | |
| VACA-DIXON SUBSTATION | WELL 01 - DESTROYED | unknown | | | | | 07/07/2005 - 07/05/2006 | 2 | 2.9 - 4.5 | 4 | | | | | | | | |
| | WELL 03 - MAIN WELL - DESTROYED | unknown | 2/4/2004 | 1 | 480 | 480 | 02/04/2004 | 1 | 3.8 | 4 | 02/04/2004 | 1 | 3.8 | 3.8 | 02/04/2004 | 1 | ND | ND |
| | WELL 05 | unknown | 5/2/2007 | 1 | 520 | 520 | 05/02/2007 - 08/04/2014 | 7 | 1.5 - 4.1 | 3 | 05/02/2007 - 06/04/2013 | 3 | ND - <2 | <2 | 05/02/2007 - 09/10/2014 | 2 | <1 - 1.1 | 1.1 |
| VACAVILLE SEVENTH DAY ADVENTIST CHURCH | WELL | unknown | 6/7/2000 | 1 | 182 | 182 | 06/07/2000 - 11/30/2012 | 7 | 1.9 - 4.3 | 3 | 06/17/2003 | 1 | 2 | 2 | | | | |
| VALLEY EVANGELICAL FREE CHURCH | WELL 01 | unknown | 11/2/1999 | 1 | 880 | 880 | 10/08/1997 - 12/07/2015 | 120 | ND - 21 | 12 | 04/10/2012 | 1 | ND | ND | | | | |
| VINEYARD RV PARK | WELL 01 | unknown | 10/12/1999 - 5/7/2012 | 3 | 320 - 330 | 327 | 06/01/1998 - 05/06/2015 | 16 | ND - 3.6 | 2 | 08/08/2001 - 05/07/2012 | 4 | ND | ND | 08/12/2015 | 1 | 0.04 | 0.04 |
| | WELL 02 | unknown | 8/8/2001 - 5/6/2015 | 3 | 320 - 340 | 330 | 06/08/1999 - 05/06/2015 | 12 | ND - 3.8 | 3 | 08/08/2001 - 08/03/2009 | 2 | 4 | 4 | 08/12/2015 | 1 | 0.29 | 0.29 |
| WEST WIND WINERY | WELL 01 | unknown | 11/2/1999 | 1 | 480 | 480 | 06/08/1999 - 07/15/2015 | 29 | 1.1 - 7 | 3 | | | | | | | | |
| WESTERN RAILROAD MUSEUM | WELL 01 | unknown | 2/8/1995 | 1 | 500 | 500 | 02/08/1995 - 02/11/2015 | 13 | 2.9 - 9.5 | 6 | 02/08/1995 | 1 | 12 | 12 | | | | |
| | WELL 02 | unknown | 9/20/2005 | 1 | 410 | 410 | 09/20/2005 - 02/11/2015 | 8 | 4.7 - 6.6 | 5 | 09/20/2005 | 1 | 9.7 | 9.7 | | | | |
| WOODEN VALLEY WINERY | WELL 01 | unknown | 11/2/1999 | 1 | 430 | 430 | 02/27/1996 - 04/23/2015 | 32 | ND - 6.6 | 2 | | | | | | | | |
| SCWA - Allendale | SCWA-Allendale MW-1235 | BT | 3/27/2008 | 1 | 300 | 300 | 03/27/2008 | 1 | 0.6 | 0.6 | 03/27/2008 | 1 | 2.5 | 2.5 | | | | |
| | SCWA-Allendale MW-1345 | BT | 3/25/2008 | 1 | 310 | 310 | 03/25/2008 | 1 | 0.5 | 0.5 | 03/25/2008 | 1 | 2.5 | 2.5 | | | | |
| | SCWA-Allendale MW-1925 | BT | 3/26/2008 | 1 | 360 | 360 | 03/26/2008 | 1 | <0.45 | <0.45 | 03/26/2008 | 1 | 2.6 | 2.6 | | | | |
| SCWA - Maine Prairie | SCWA-MainePrairie MW-2170 | BT | 4/29/2008 | 1 | 350 | 350 | 04/29/2008 | 1 | <0.45 | <0.45 | 04/29/2008 | 1 | 4.9 | 4.9 | | | | |
| | SCWA-MainePrairie MW-1960 | BT | 4/29/2008 | 1 | 380 | 380 | 04/29/2008 | 1 | <0.45 | <0.45 | 04/29/2008 | 1 | 5 | 5 | | | | |
| | SCWA-MainePrairie MW-840 | TEH_GEN | 4/30/2008 | 1 | 530 | 530 | 04/30/2008 | 1 | 2.1 | 2.1 | 04/30/2008 | 1 | 7.1 | 7.1 | | | | |
| SCWA - Meridian | SCWA-Meridian MW-1680 | BT | 6/4/2008 | 1 | 320 | 320 | 06/04/2008 | 1 | 0.8 | 0.8 | 06/04/2008 | 1 | 3.3 | 3.3 | | | | |
| | SCWA-Meridian MW-400 | TEH_GEN | 6/4/2008 | 1 | 350 | 350 | 06/04/2008 | 1 | 0.5 | 0.5 | 06/04/2008 | 1 | <2 | <2 | | | | |
| | SCWA-Meridian MW-825 | TEH_GEN | 6/3/2008 | 1 | 380 | 380 | 06/03/2008 | 1 | 0.56 | 0.56 | 06/03/2008 | 1 | <2 | <2 | | | | |
| SCWA - Dixon | SCWA-Dixon MW-1200 | TEH_GEN | 10/1/2009 | 1 | 350 | 350 | 10/01/2009 | 1 | <0.45 | <0.45 | 10/01/2009 | 1 | 3.1 | 3.1 | | | | |
| | SCWA-Dixon MW-2212 | BT | 10/1/2009 | 1 | 310 | 310 | 10/01/2009 | 1 | <0.45 | <0.45 | 10/01/2009 | 1 | 3.2 | 3.2 | | | | |
| | SCWA-Dixon MW-2370 | BT | 9/30/2009 | 1 | 330 | 330 | 09/30/2009 | 1 | <0.45 | <0.45 | 09/30/2009 | 1 | 8.6 | 8.6 | | | | |
| Department of Water Resources (DWR) | 03N01E04B001M | unknown | 07/18/1973 - 09/13/2013 | 15 | 595 - 763.8 | 675 | 05/15/1975 - 09/13/2013 | 8 | <0.02 - 1.3 | 1.2 | 09/13/2013 | 1 | 11 | 11 | | | | |
| | 03N01E09H001M | | 9/22/1980 | 1 | 1460 | 1460 | | | | | 09/22/1980 | 1 | ND | ND | | | | |
| | 03N01E21D001M | unknown | 08/02/1971 - 06/07/1976 | 3 | 1140 - 1701.8 | 1352 | 07/10/1974 | 1 | 0.1 | 0.1 | | | | | | | | |
| | 03N01E22F002M | unknown | 08/01/1972 - 07/20/2006 | 12 | 777 - 1427.1 | 1117 | 07/03/1979 - 07/20/2006 | 5 | 1.6 - 12.6 | 6.3 | | | | | | | | |
| | 03N03W18G001M | unknown | 08/05/1971 - 06/11/1976 | 3 | 657 - 770.5 | 728 | 07/24/1974 | 1 | 3.6 | 3.6 | | | | | | | | |
| | 03N03W18G002M | unknown | 07/31/1973 - 07/17/1981 | 3 | 829 - 904.5 | 859 | 05/29/1975 | 1 | 8.1 | 8.1 | | | | | | | | |
| | 03N04W05M001M | unknown | 07/31/1973 - 08/07/1986 | 7 | 938 - 1118.9 | 1065 | 11/16/1982 | 1 | 7.5 | 7.5 | | | | | | | | |
| | 04N01E01J001M | unknown | 07/29/1970 - 07/07/1987 | 9 | 953 - 1326.6 | 1145 | 07/29/1970 - 06/27/1980 | 2 | 5.4 - 7.9 | 6.7 | | | | | | | | |
| | 04N01E03A001M | | 9/17/1980 | 1 | 750 | 750 | | | | | 09/17/1980 | 1 | ND | ND | | | | |
| | 04N01E08F001M | unknown | 07/09/1954 - 08/06/2014 | 33 | 604 - 1660 | 732 | 07/09/1954 - 08/06/2014 | 14 | 0.5 - 4.5 | 2 | 08/06/2014 | 1 | 24 | 24 | | | | |

Appendix D Summary Table of Solano County Groundwater Quality-Select Constituents

| | | | Total Dissolved Solids | | | | Nitrate (as Nitrogen) | | | | Arsenic | | | | Chromium VI | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Well ID | Zone[1] | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) |
| Department of Water Resources (DWR) | 04N01E12B002M | | 9/17/1980 | 1 | 887 | 887 | | | | | | | | | | | | |
| | 04N01E20F001M | UNK | 07/12/1977 - 08/06/2014 | 12 | 460 - 663 | 543 | 07/12/1977 - 08/06/2014 | 7 | 2.5 - 20.1 | 11.7 | 08/06/2014 | 1 | 3 | 3 | | | | |
| | 04N01E35R001M | UNK | 9/22/1980 | 1 | 822 | 822 | | | | | | | | | | | | |
| | 04N01W03R001M | | 07/11/1978 - 07/14/1988 | 7 | 313 - 458.28 | 408 | 07/11/1978 - 06/17/1980 | 3 | 0.4 - 2.2 | 1.3 | | | | | | | | |
| | 04N01W32G001M | UNK | 06/07/1976 - 07/26/1990 | 7 | 243.88 - 3497.4 | 2869 | 06/07/1976 - 07/24/1986 | 2 | 1.5 - 1.5 | 1.5 | | | | | | | | |
| | 04N01W33A001M | unknown | 07/19/1973 - 08/31/2005 | 10 | 178 - 3304 | 2608 | 08/19/1982 - 08/31/2005 | 4 | <0.02 - 1.8 | 0.8 | | | | | | | | |
| | 04N02E11R001M | | 9/17/1980 | 1 | 708 | 708 | | | | | 09/17/1980 | 1 | ND | ND | | | | |
| | 04N02E16H001M | | 9/17/1980 | 1 | 403 | 403 | | | | | | | | | | | | |
| | 04N02E18N001M | | 9/17/1980 | 1 | 573 | 573 | | | | | 09/17/1980 | 1 | ND | ND | | | | |
| | 04N02E22P001M | QA_UT? | 06/08/1976 - 10/29/2010 | 12 | 385 - 538.01 | 441 | 06/08/1976 - 10/29/2010 | 6 | <0.02 - 1.3 | 1 | | | | | | | | |
| | 04N02E25L001M | | 9/23/1980 | 1 | 391 | 391 | | | | | 09/23/1980 | 1 | ND | ND | | | | |
| | 04N02E30M001M | | 9/17/1980 | 1 | 660 | 660 | | | | | | | | | | | | |
| | 04N02W04D001M | unknown | 08/03/1971 - 08/06/2014 | 12 | 695 - 971.5 | 836 | 07/09/1974 - 08/06/2014 | 6 | 0.1 - 5.6 | 2.2 | 08/06/2014 | 1 | 1 | 1 | | | | |
| | 04N02W05L007M | UNK | 06/07/1976 - 07/26/1999 | 9 | 544 - 777.2 | 699 | 06/07/1976 - 07/26/1999 | 3 | <0.02 - 0.3 | 0.3 | | | | | | | | |
| | 04N02W05Q002M | unknown | 08/02/1972 - 08/06/2014 | 11 | 319 - 964.8 | 618 | 06/18/1980 - 08/06/2014 | 6 | <0.02 - <0.02 | <0.02 | 08/06/2014 | 1 | 7 | 7 | | | | |
| | 04N02W09H001M | UNK | 07/19/1973 - 08/06/2014 | 12 | 1960 - 2826 | 2321 | 05/20/1975 - 08/06/2014 | 5 | <0.02 - 0.2 | 0.1 | 08/06/2014 | 1 | 75 | 75 | | | | |
| | 04N02W18M001M | unknown | 08/03/1971 - 08/28/2015 | 12 | 584 - 857.6 | 725 | 07/09/1974 - 08/28/2015 | 7 | 0.4 - 3.4 | 0.9 | 09/13/2013 - 08/28/2015 | 2 | ND - 1 | 1 | | | | |
| | 04N03E09D001M | | 9/23/1980 | 1 | 646 | 646 | | | | | 09/23/1980 | 1 | ND | ND | | | | |
| | 04N03E11P002M | | 9/23/1980 | 1 | 650 | 650 | | | | | 09/23/1980 | 1 | ND | ND | | | | |
| | 04N03E30C001M | | 9/23/1980 | 1 | 660 | 660 | | | | | | | | | | | | |
| | 04N03E31F002M | unknown | 05/18/1959 - 09/12/2007 | 25 | 422 - 585 | 531 | 05/18/1959 - 09/12/2007 | 10 | 1.4 - 5.6 | 2.2 | | | | | | | | |
| | 04N03W12G001M | UNK | 07/12/1977 - 08/06/2014 | 10 | 998 - 1490 | 1282 | 07/12/1977 - 08/06/2014 | 5 | 2.6 - 7 | 5.3 | 08/06/2014 | 1 | 2 | 2 | | | | |
| | 04N03W13G002M | | 08/02/1972 - 07/09/1974 | 2 | 665.98 - 670 | 668 | | | | | | | | | | | | |
| | 05N01E01N001M | UNK | 09/04/1958 - 08/05/1965 | 8 | 1145.7 - 2330 | 1387 | 09/04/1958 - 05/21/1963 | 7 | 0.1 - 36 | 5.4 | | | | | | | | |
| | 05N01E04G001M | | 9/11/1980 | 1 | 845 | 845 | | | | | 09/11/1980 | 1 | ND | ND | | | | |
| | 05N01E14A001M | | 9/11/1980 | 1 | 566 | 566 | | | | | | | | | | | | |
| | 05N01E23R001M | unknown | 07/28/1969 - 07/11/1989 | 17 | 439 - 592.28 | 486 | 07/28/1969 - 06/23/1981 | 13 | <0.02 - 0.2 | 0.2 | | | | | | | | |
| | 05N01E25J001M | | 9/11/1980 | 1 | 706 | 706 | | | | | | | | | | | | |
| | 05N01E28K001M | unknown | 2/1/1980 | 1 | 3370 | 3370 | 02/01/1980 | 1 | <0.02 | <0.02 | | | | | | | | |
| | 05N01E28Q006M | unknown | 2/1/1980 | 1 | 265 | 265 | 02/01/1980 | 1 | <0.02 | <0.02 | | | | | | | | |
| | 05N01E35B001M | unknown | 08/12/1971 - 07/11/1989 | 14 | 876 - 1185.9 | 1007 | 08/12/1971 - 06/23/1981 | 11 | 10.4 - 15.8 | 13.6 | | | | | | | | |
| | 05N01E36A001M | UNK | 07/28/1969 - 07/20/1973 | 3 | 553 - 730.3 | 649 | 07/28/1969 - 07/22/1970 | 2 | 1.2 - 1.8 | 1.5 | | | | | | | | |
| | 05N01W13D001M | QA_KU? | 9/16/1980 | 1 | 418 | 418 | 06/07/1976 - 08/06/2014 | 6 | 1.7 - 19 | 5.9 | 09/16/1980 | 1 | ND | ND | | | | |
| | 05N01W15B001M | | 7/19/1984 | 1 | 757.1 | 757 | | | | | | | | | | | | |
| | 05N01W15D001M | | 06/07/1976 - 08/06/2014 | 11 | 451 - 958.1 | 702 | | | | | 08/06/2014 | 1 | 1 | 1 | | | | |
| | 05N01W15P001M | | 9/16/1980 | 1 | 1650 | 1650 | | | | | | | | | | | | |
| | 05N01W19K001M | UNK | 8/2/1972 | 1 | 552 | 552 | 08/02/1972 | 1 | 4.3 | 4.3 | | | | | | | | |
| | 05N01W19K002M | unknown | 7/16/1974 | 1 | 564 | 564 | 07/16/1974 | 1 | 3.8 | 3.8 | | | | | | | | |
| | 05N01W25R001M | UNK | 08/02/1971 - 06/24/1981 | 9 | 1090 - 1470 | 1238 | 06/04/1976 - 06/24/1981 | 6 | 3.2 - 4.1 | 3.7 | | | | | | | | |
| | 05N01W28P001M | UNK | 07/19/1973 - 07/18/1985 | 9 | 395.3 - 543.37 | 466 | 07/08/1977 - 06/24/1981 | 5 | 0.3 - 2 | 1.2 | | | | | | | | |
| | 05N01W29C001M | UNK | 06/27/1974 - 05/15/1975 | 2 | 1190 - 1450 | 1320 | 06/27/1974 - 05/15/1975 | 2 | 3.8 - 4.1 | 4 | | | | | | | | |
| | 05N01W30H001M | unknown | 07/23/1971 - 07/08/1977 | 7 | 636 - 867 | 754 | 07/23/1971 - 07/08/1977 | 7 | 8.4 - 11.7 | 9.7 | | | | | | | | |
| | 05N01W30J001M | unknown | 7/23/1971 | 1 | 1190 | 1190 | 07/23/1971 | 1 | 1.8 | 1.8 | | | | | | | | |
| | 05N01W30J002M | unknown | 08/01/1972 - 07/18/1973 | 2 | 966 - 1160 | 1063 | 08/01/1972 - 07/18/1973 | 2 | 2.7 - 4.7 | 3.7 | | | | | | | | |
| | 05N01W35E001M | QA_KU? | 07/08/1977 - 09/11/2007 | 8 | 1140 - 1728.6 | 1429 | 07/08/1977 - 09/11/2007 | 6 | 2.9 - 11.6 | 7.7 | | | | | | | | |
| | 05N02E15F001M | unknown | 08/14/1972 - 08/21/2015 | 17 | 574 - 777.2 | 644 | 07/11/1974 - 08/21/2015 | 9 | <0.02 - 0.05 | 0.05 | 11/01/2011 - 08/21/2015 | 3 | 5 - 7 | 6 | | | | |
| | 05N02E25K001M | QA | 08/27/1958 - 07/21/1970 | 14 | 884 - 1284 | 1031 | 08/27/1958 - 07/16/1969 | 7 | <0.02 - 0.6 | 0.4 | | | | | | | | |
| | 05N02E25P002M | unknown | 06/08/1976 - 11/01/2011 | 12 | 663 - 844.2 | 740 | 06/08/1976 - 11/01/2011 | 6 | <0.02 - 0.1 | 0.1 | 09/23/1980 | 1 | ND | ND | | | | |
| | 05N02W08H007M | unknown | 08/02/1972 - 08/28/2015 | 15 | 327 - 435.5 | 369 | 08/02/1972 - 08/28/2015 | 8 | 2.1 - 6.6 | 4.7 | 09/13/2013 - 08/28/2015 | 2 | ND - 1 | 1 | | | | |
| | 05N02W21P003M | UNK | 08/03/1971 - 08/28/2015 | 15 | 489 - 659.95 | 585 | 07/05/1979 - 08/28/2015 | 7 | 2.5 - 8.1 | 4.1 | 08/28/2015 | 1 | ND | ND | | | | |
| | 05N02W27L002M | UNK | 07/09/1974 - 08/15/1988 | 8 | 556 - 1192.6 | 836 | 07/09/1974 - 07/19/1984 | 2 | 6.6 - 7.9 | 7.2 | | | | | | | | |
| | 05N02W29L003M | unknown | 07/09/1974 - 08/01/1986 | 6 | 334 - 395.97 | 361 | 07/09/1974 - 07/19/1984 | 2 | 1.5 - 3.6 | 2.6 | | | | | | | | |
| | 05N02W34N001M | unknown | 07/19/1973 - 07/17/1985 | 7 | 732 - 958.1 | 826 | 07/19/1973 - 06/15/1983 | 2 | 2 - 3.6 | 2.8 | | | | | | | | |
| | 05N02W34P004M | unknown | 07/09/1974 - 07/19/1984 | 5 | 817.4 - 1005 | 917 | 07/09/1974 | 1 | 14 | 14 | | | | | | | | |
| | 05N03E03H001M | | 9/23/1980 | 1 | 304 | 304 | | | | | 09/23/1980 | 1 | 10 | 10 | | | | |
| | 05N03E15M001M | | 9/23/1980 | 1 | 397 | 397 | | | | | | | | | | | | |
| | 05N03E26H001M | | 9/23/1980 | 1 | 415 | 415 | | | | | | | | | | | | |

Appendix D Summary Table of Solano County Groundwater Quality-Select Constituents

| | Well ID | Zone[1] | Total Dissolved Solids: Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Nitrate (as Nitrogen): Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Arsenic: Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) | Chromium VI: Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Department of Water Resources (DWR) | 06N01E03A002M | | 9/4/1980 | 1 | 385 | 385 | | | | | | | | | | | | |
| | 06N01E05A001M | UT | 06/08/1976 - 08/21/2015 | 16 | 317 - 632 | 522 | 06/08/1976 - 08/21/2015 | 10 | 0.7 - 12.5 | 8 | 11/01/2011 - 08/21/2015 | 3 | 3 - 5 | 4 | | | | |
| | 06N01E06F002M | | 9/9/1980 | 1 | 370 | 370 | | | | | 09/09/1980 | 1 | ND | ND | | | | |
| | 06N01E11H001M | | 9/3/1980 | 1 | 671 | 671 | | | | | | | | | | | | |
| | 06N01E13J002M | unknown | 08/03/1971 - 10/29/2010 | 14 | 334 - 600 | 394 | 08/03/1971 - 10/29/2010 | 6 | 0.1 - 8 | 1.5 | | | | | | | | |
| | 06N01E18C002M | | 9/4/1980 | 1 | 1130 | 1130 | | | | | 09/04/1980 | 1 | ND | ND | | | | |
| | 06N01E18L001M | | 9/4/1980 | 1 | 610 | 610 | | | | | 09/04/1980 | 1 | ND | ND | | | | |
| | 06N01E19L001M | unknown | 08/26/1958 - 05/18/1959 | 2 | 494 - 609.03 | 552 | 08/26/1958 - 05/18/1959 | 2 | 4.5 - 4.5 | 4.5 | | | | | | | | |
| | 06N01E19L002M | unknown | 09/28/1960 - 07/25/1990 | 20 | 344 - 696.8 | 542 | 09/28/1960 - 06/24/1980 | 5 | 2.5 - 12.2 | 6.1 | | | | | | | | |
| | 06N01E19Q001M | unknown | 05/19/1961 - 07/12/1989 | 19 | 356 - 623.77 | 510 | 05/19/1961 - 07/12/1989 | 6 | 0 - 3.2 | 2 | | | | | | | | |
| | 06N01E21K001M | | 9/14/1980 | 1 | 534 | 534 | | | | | | | | | | | | |
| | 06N01E23C002M | | 9/4/1980 | 1 | 550 | 550 | | | | | 09/04/1980 | 1 | ND | ND | | | | |
| | 06N01E26G001M | | 9/4/1980 | 1 | 760 | 760 | | | | | | | | | | | | |
| | 06N01E32M001M | | 9/4/1980 | 1 | 592 | 592 | | | | | 09/04/1980 | 1 | ND | ND | | | | |
| | 06N01W01B004M | unknown | 07/20/1973 - 07/12/1989 | 9 | 373.86 - 475.7 | 440 | 07/06/1979 - 07/12/1989 | 2 | 3.8 - 4.5 | 4.2 | | | | | | | | |
| | 06N01W01E001M | unknown | 08/23/1972 - 08/20/2015 | 16 | 278 - 735 | 510 | 08/23/1972 - 08/20/2015 | 8 | 0.4 - 5 | 3.4 | 11/02/2011 - 08/20/2015 | 3 | 4 - 8 | 6 | | | | |
| | 06N01W04G001M | | 9/9/1980 | 1 | 268 | 268 | | | | | | | | | | | | |
| | 06N01W12P001M | | 9/9/1980 | 1 | 581 | 581 | | | | | | | | | | | | |
| | 06N01W20A001M | | 9/9/1980 | 1 | 539 | 539 | | | | | 09/09/1980 | 1 | ND | ND | | | | |
| | 06N01W23L001M | unknown | 04/14/1953 - 07/25/1990 | 23 | 274 - 470 | 373 | 04/14/1953 - 07/25/1990 | 9 | 0.2 - 1.6 | 0.9 | | | | | | | | |
| | 06N01W23L004M | unknown | 6/7/1990 | 1 | 340 | 340 | 06/07/1990 | 1 | 1.7 | 1.7 | | | | | | | | |
| | 06N01W24E002M | | 9/3/1980 | 1 | 425 | 425 | | | | | | | | | | | | |
| | 06N01W29C003M | | 9/12/1980 | 1 | 786 | 786 | | | | | | | | | | | | |
| | 06N01W36C004M | UT | 06/09/1976 - 08/20/2015 | 16 | 402 - 538.01 | 446 | 06/09/1976 - 08/20/2015 | 9 | 3.4 - 6.3 | 4.9 | 11/02/2011 - 08/20/2015 | 3 | ND - 1 | 1 | | | | |
| | 06N01W36E002M | | 9/16/1980 | 1 | 413 | 413 | | | | | 09/16/1980 | 1 | ND | ND | | | | |
| | 06N02E01A001M | | 9/2/1980 | 1 | 515 | 515 | | | | | | | | | | | | |
| | 06N02E06A001M | | 9/2/1980 | 1 | 383 | 383 | | | | | 09/02/1980 | 1 | ND | ND | | | | |
| | 06N02E15P001M | | 9/2/1980 | 1 | 449 | 449 | | | | | 09/02/1980 | 1 | ND | ND | | | | |
| | 06N02E19J001M | QA_UT | 05/23/1975 - 07/25/1990 | 8 | 698 - 1152.4 | 906 | 05/23/1975 - 07/25/1990 | 3 | 5.9 - 11.3 | 7.9 | | | | | | | | |
| | 06N02E23A001M | | 9/3/1980 | 1 | 1520 - 1520 | 1520 | | | | | 09/03/1980 | 1 | ND | ND | | | | |
| | 06N02E30M002M | | 9/2/1980 | 1 | 414 | 414 | | | | | | | | | | | | |
| | 06N02E32N002M | UNK | 9/11/1980 | 1 | 2000 | 2000 | 08/23/1972 - 10/29/2010 | 6 | <0.02 - 10.7 | 8 | | | | | | | | |
| | 06N02W12R002M | | 9/22/1980 | 1 | 600 | 600 | | | | | 09/22/1980 | 1 | ND | ND | | | | |
| | 06N02W25J001M | | 9/22/1980 | 1 | 526 | 526 | | | | | | | | | | | | |
| | 07N01E08N002M | | 08/23/1972 - 10/29/2010 | 13 | 218 - 455 | 350 | | | | | | | | | | | | |
| | 07N01E12H001M | | 8/26/1980 | 1 | 613 | 613 | | | | | 08/26/1980 | 1 | ND | ND | | | | |
| | 07N01E13M001M | unknown | 08/13/1979 - 06/17/1986 | 3 | 324.95 - 436.17 | 379 | 08/13/1979 - 06/17/1986 | 3 | 1.1 - 3.6 | 2.3 | | | | | | | | |
| | 07N01E14D004M | | 9/3/1980 | 1 | 363 | 363 | | | | | | | | | | | | |
| | 07N01E14G002M | unknown | 09/03/1975 - 06/20/1988 | 10 | 333 - 408.7 | 369 | 09/03/1975 - 06/20/1988 | 10 | 1.8 - 4.7 | 3.1 | | | | | | | | |
| | 07N01E14J001M | unknown | 09/05/1974 - 06/20/1988 | 9 | 551 - 633.15 | 612 | 09/05/1974 - 06/20/1988 | 9 | 6.8 - 10.6 | 8.5 | | | | | | | | |
| | 07N01E14N003M | unknown | 05/17/1976 - 06/19/1985 | 6 | 397.98 - 496.47 | 462 | 05/17/1976 - 06/19/1985 | 6 | 2.5 - 5 | 3.9 | | | | | | | | |
| | 07N01E18J001M | | 8/26/1980 | 1 | 319 | 319 | 05/10/1954 | 1 | 6.3 | 6.3 | 08/26/1980 | 1 | ND | ND | | | | |
| | 07N01E23A001M | unknown | 5/10/1954 | 1 | 645.21 | 645 | | | | | | | | | | | | |
| | 07N01E23A002M | unknown | 01/05/1950 - 04/20/1987 | 10 | 313.56 - 750.4 | 658 | 01/05/1950 - 04/20/1987 | 10 | 0.8 - 10.4 | 8.1 | | | | | | | | |
| | 07N01E23A004M | unknown | 05/10/1954 - 07/11/1986 | 9 | 382 - 492.45 | 415 | 05/10/1954 - 07/11/1986 | 9 | 1.8 - 4.5 | 3.2 | | | | | | | | |
| | 07N01E23D002M | unknown | 04/18/1979 - 06/19/1985 | 3 | 355.1 - 385.25 | 374 | 04/18/1979 - 06/19/1985 | 3 | 2.7 - 3.8 | 3.5 | | | | | | | | |
| | 07N01E23G002M | unknown | 07/30/1974 - 06/20/1988 | 9 | 437 - 603 | 515 | 07/30/1974 - 06/20/1988 | 9 | 4.1 - 8.6 | 6.1 | | | | | | | | |
| | 07N01E24C002M | unknown | 05/10/1954 - 04/20/1987 | 11 | 399.99 - 700.15 | 613 | 05/10/1954 - 04/20/1987 | 11 | 2.1 - 10.2 | 6.9 | | | | | | | | |
| | 07N01E25J001M | | 8/28/1980 | 1 | 820 | 820 | | | | | | | | | | | | |
| | 07N01E27N004M | | 9/3/1980 | 1 | 519 | 519 | | | | | 09/03/1980 | 1 | ND | ND | | | | |
| | 07N01E30F001M | | 8/26/1980 | 1 | 234 | 234 | | | | | | | | | | | | |
| | 07N01E36C001M | unknown | 08/28/1958 - 08/01/1986 | 16 | 550 - 850.9 | 698 | 08/28/1958 - 06/24/1980 | 6 | 1.7 - 10.2 | 3.9 | | | | | | | | |
| | 07N01W05F001M | | 9/10/1980 | 1 | 312 | 312 | | | | | 09/10/1980 | 1 | ND | ND | | | | |
| | 07N01W11B001M | | 9/10/1980 | 1 | 246 | 246 | | | | | | | | | | | | |
| | 07N01W14P003M | UT_QA? | 08/03/1971 - 08/20/2015 | 16 | 233 - 257.95 | 248 | 08/03/1971 - 08/20/2015 | 8 | 1.9 - 2.6 | 2.4 | 11/02/2011 - 08/20/2015 | 3 | ND - 1 | 1 | | | | |
| | 07N01W22D001M | | 9/10/1980 | 1 | 279 | 279 | | | | | | | | | | | | |
| | 07N01W25J001M | | 9/10/1980 | 1 | 623 | 623 | | | | | | | | | | | | |

Appendix D Summary Table of Solano County Groundwater Quality-Select Constituents

| | | | Total Dissolved Solids | | | | Nitrate (as Nitrogen) | | | | Arsenic | | | | Chromium VI | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Well ID | Zone[1] | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (mg/L) | Average Value (mg/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) | Range of Sample Dates | Number of Samples | Range of Values (ug/L) | Average Value (ug/L) |
| Department of Water Resources (DWR) | 07N01W28N001M | | 9/10/1980 | 1 | 346 | 346 | | | | | 09/10/1980 | 1 | ND | ND | | | | |
| | 07N01W28Q001M | unknown | 08/14/1972 - 08/20/2015 | 16 | 240 - 351.08 | 290 | 08/14/1972 - 08/20/2015 | 8 | 1.7 - 3.8 | 3 | 11/02/2011 - 08/20/2015 | 3 | ND - 1 | 1 | | | | |
| | 07N01W34R001M | | 9/12/1980 | 1 | 270 - 270 | 270 | | | | | 09/12/1980 | 1 | ND | ND | | | | |
| | 07N01W34R002M | | 9/12/1980 | 1 | 311 - 311 | 311 | | | | | 09/12/1980 | 1 | ND | ND | | | | |
| | 07N02E02C001M | | 8/27/1980 | 1 | 731 - 731 | 731 | | | | | | | | | | | | |
| | 07N02E02D001M | unknown | 08/28/1958 - 10/28/2010 | 16 | 523.27 - 811 | 670 | 08/28/1958 - 10/28/2010 | 6 | 1.6 - 12.9 | 4.4 | | | | | | | | |
| | 07N02E02F002M | UT_QA? | 05/21/1975 - 10/28/2010 | 9 | 482 - 749 | 634 | 05/21/1975 - 10/28/2010 | 4 | 1.8 - 10.3 | 7.4 | | | | | | | | |
| | 07N02E06N001M | UT | 05/21/1975 - 08/21/2015 | 16 | 350 - 552.75 | 455 | 05/21/1975 - 08/21/2015 | 10 | 2.6 - 7.7 | 4.7 | 11/02/2011 - 08/21/2015 | 3 | 3 | 3 | | | | |
| | 07N02E06N002M | UNK | 06/09/1976 - 07/30/1980 | 3 | 376 - 525.95 | 461 | 06/09/1976 | 1 | 4.1 | 4.1 | | | | | | | | |
| | 07N02E06N003M | TEH_GEN_QA? | 08/01/1986 - 08/21/2015 | 3 | 294 - 306 | 300 | 08/01/1986 - 08/21/2015 | 3 | 1.1 - 2.5 | 2 | 11/01/2011 - 08/21/2015 | 2 | 4 | 4 | | | | |
| | 07N02E07R003M | | 8/27/1980 | 1 | 598 | 598 | 08/03/1971 - 07/26/1984 | 2 | 10.2 - 12.9 | 11.5 | 08/27/1980 | 1 | ND | ND | | | | |
| | 07N02E14C001M | | 8/27/1980 | 1 | 476 | 476 | 08/28/1958 - 10/29/2013 | 12 | 0.8 - 26.7 | 9.2 | | | | | | | | |
| | 07N02E17F002M | | 8/28/1980 | 1 | 585 | 585 | | | | | 08/28/1980 | 1 | ND | ND | | | | |
| | 07N02E18R002M | unknown | 08/03/1971 - 07/17/1990 | 10 | 639.18 - 783.9 | 726 | | | | | | | | | | | | |
| | 07N02E26K001M | | 8/27/1980 | 1 | 530 | 530 | | | | | 08/27/1980 | 1 | ND | ND | | | | |
| | 07N02E30J002M | | 8/27/1980 | 1 | 547 | 547 | | | | | | | | | | | | |
| | 07N02E34C002M | UNK | 08/28/1958 - 10/29/2013 | 24 | 448 - 929 | 634 | | | | | 11/01/2011 | 1 | 3 | 3 | | | | |
| | 07N02E35D001M | QA | 11/15/2005 | 1 | 412 | 412 | 11/15/2005 | 1 | 2.8 | 2.8 | 11/15/2005 | 1 | 3 | 3 | | | | |
| | 07N02E35D002M | UT | 11/15/2005 | 1 | 409 | 409 | 11/15/2005 | 1 | 5.3 | 5.3 | 11/15/2005 | 1 | 4 | 4 | | | | |
| | 07N02E35D003M | UT | 11/15/2005 | 1 | 381 | 381 | 11/15/2005 | 1 | 0.5 | 0.5 | 11/15/2005 | 1 | 4 | 4 | | | | |
| | 07N02E35Q001M | | 9/9/1980 | 1 | 659 | 659 | | | | | | | | | | | | |
| | 08N01E20F003M | | 8/25/1980 | 1 | 651 | 651 | | | | | | | | | | | | |
| | 08N01E22B001M | | 8/25/1980 | 1 | 288 | 288 | | | | | 08/25/1980 | 1 | ND | ND | | | | |
| | 08N01E26F001M | unknown | 08/01/1952 - 10/28/2010 | 21 | 420.09 - 763.8 | 604 | 08/01/1952 - 10/28/2010 | 7 | 1.3 - 9.7 | 3.6 | | | | | | | | |
| | 08N01E32P001M | | 9/3/1980 | 1 | 308 | 308 | | | | | 09/03/1980 | 1 | ND | ND | | | | |
| | 08N01E36J001M | | 8/25/1980 | 1 | 590 | 590 | | | | | 08/25/1980 | 1 | ND | ND | | | | |
| | 08N01W23A001M | unknown | 05/18/1959 - 06/14/1976 | 7 | 294 - 408.7 | 357 | 05/18/1959 - 07/29/1969 | 2 | 1 - 1.1 | 1.1 | | | | | | | | |
| | 08N01W23A002M | unknown | 08/21/1978 - 10/28/2010 | 4 | 278 - 441.53 | 392 | 08/21/1978 - 10/28/2010 | 1 | 1.2 | 1.2 | | | | | | | | |
| | 08N01W26G002M | | 8/26/1980 | 1 | 626 | 626 | | | | | | | | | | | | |
| | 08N01W28J001M | TEH_GEN_QA? | 07/09/1979 - 08/21/2015 | 14 | 212 - 498.48 | 259 | 07/09/1979 - 08/21/2015 | 10 | 0 - 0.8 | 0.3 | 11/02/2011 - 08/21/2015 | 3 | ND - 1 | 1 | | | | |
| | 08N01W33E002M | | 8/26/1980 | 1 | 325 | 328 | | | | | 08/26/1980 | 1 | ND | ND | | | | |
| | 08N02E15P001M | | 8/25/1980 | 1 | 785 | 785 | | | | | | | | | | | | |
| | 08N02E21B002M | | 8/26/1981 | 1 | 323 | 323 | | | | | 08/26/1981 | 1 | ND | ND | | | | |
| | 08N02E21K001M | unknown | 11/11/1971 - 07/11/1988 | 9 | 319 - 568.16 | 379 | 11/11/1971 - 08/23/1982 | 2 | 0.1 - 0.2 | 0.2 | | | | | | | | |
| | 08N02E24J003M | | 8/25/1980 | 1 | 613 | 613 | | | | | | | | | | | | |
| | 08N02E29G001M | | 8/25/1980 | 1 | 637 | 637 | | | | | | | | | | | | |
| | 08N02E35B001M | | 8/25/1980 | 1 | 417 | 417 | | | | | 08/25/1980 | 1 | ND | ND | | | | |
| | 08N02W36L001M | | 8/26/1980 | 1 | 327 | 327 | | | | | | | | | | | | |
| | 08N02W36L002M | unknown | 9/2/1982 | 1 | 345 | 345 | 09/02/1982 | 1 | 0.4 | 0.4 | | | | | | | | |

1. BT = Basal Tehama, BT_MT = Basal Tehama (primary) & Middle Tehama, MARK = Markley Formation, MT = Middle Tehama, QA = Quarternary Alluvium, QA? = Quaternary Alluvium (possible), QA_KU? = Quaternary Alluvium (primary) & undifferentiated Cretaceous Rock (possible), QA_UT = Quaternary Alluvium (primary) & Upper Tehama, QA_UT? = Quaternary Alluvium (primary) & Upper Tehama (possible), TEH_GEN = Tehama (general), TEH_GEN_QA = Tehama (general, primary) & Quaternary Alluvium, TEH_GEN_QA? = Tehama (general, primary) & Quaternary Alluvium (possible), UNK = unknown, UT = Upper Tehama, UT? = Upper Tehama (possible), UT_QA = Upper Tehama (primary) & Quaternary Alluvium, UT_QA? = Upper Tehama (primary) & Quaternary Alluvium (possible)

# APPENDIX D

# CITY OF VACAVILLE
# WATER SUPPLY CONTRACTS

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City of Vacaville

# Water Contract Identification

As of December 31, 2015

Senate Bill 610 requirements include documentation identifying and quantifying water rights, and contracts and/or entitlements for water supplies. The table below lists the original surface water contract title and the corresponding annual allocations.

| Contract Title | Allocations (Acre-feet/Year) |
|---|---|
| SOLANO PROJECT WATER | |
| Solano County Water Agency Agreement with City of Vacaville for Participating Agency Contract for Solano Project Water Service, March 9, 1999 | 5,600 |
| Agreement Between the City of Vallejo and the City of Vacaville Relating to Purchase of Solano Project Water Entitlement, April 25, 2000 | 150 |
| Vacaville/Solano Irrigation District Master Water Agreement, May 25, 1995, 2nd Amendment Approved June 8, 2010. | 10,050 |
| STATE WATER PROJECT WATER | |
| Solano County Flood Control and Water Conservation District (SCFCWCD) Member Unit Contract for Water Service for City of Vacaville from North Bay Aqueduct, December 19, 1963. Subsequent revisions and amendments to contract between Solano County Water Agency (formerly SCFCWCD) and City of Vacaville dated 1979, 1985 (2 amendments), 1987, and 1991 | 6,100 |
| Kern County Water Agreement - Second Amendment to the Member Unit Contract dated October 22, 1985, Between the Solano County Water Agency and the City of Vacaville, August 10, 2000 | 2,878 |
| SETTLEMENT WATER | |
| Settlement Agreement Among the Department of Water Resources of the State of California, the Solano County Water Agency, and the Cities of Fairfield, Vacaville and Benicia for Purposes of Water Supply, May 19, 2003 | 9,320 |

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# APPENDIX E

# 2014 URBAN WATER SHORTAGE CONTINGENCY PLAN

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# CITY OF VACAVILLE
# URBAN WATER SHORTAGE CONTINGENCY PLAN

# FINAL

## AN AMENDMENT TO THE URBAN WATER MANAGEMENT PLAN

## ADOPTED JANUARY 1991
## REVISED JUNE 2015

Prepared by:

City of Vacaville
Utilities Department
650 Merchant Street
Vacaville, CA 95688

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**Sections**



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**Appendices**

## SECTION 1. Plan Overview and Purpose

The following plan has been updated in accordance with the Urban Water Management Planning Act and California Water Code Sections 10610 and 10632 (Appendix A), which require all urban water suppliers in California to prepare, adopt, and submit an amendment to its Urban Water Management Plan (UWMP). This amendment, titled the Urban Water Shortage Contingency Plan (UWSCP), outlines progressive steps to be taken to insure adequate water supply during drought years or other water shortage emergencies.

The City of Vacaville (City) prepared and submitted its first UWSCP in January 1991 as part of the City's 1991 UWMP update. The UWSCP was updated in August 2014 in response to the Emergency Drought Regulations issued on July 15, 2014 by the State Water Resources Control Board (SWRCB).

### 1.1 Compliance with City of Vacaville Municipal Code

The UWSCP complies with Section 13.20 of the City of Vacaville Municipal Code (Municipal Code) titled "Water Conservation in Normal, Drought and Emergency Conditions" (Appendix B). The Municipal Code is referenced or quoted in the UWSCP where appropriate.

### 1.2 Establishment of Water Conservation Conditions

The Municipal Code defines three water conservation conditions. The UWSCP addresses water conservation during normal, drought, and emergency conditions as defined below.

<u>Normal Conditions (MC 13.20.040)</u>

The normal conservation condition is in effect any time when drought or emergency conditions are not in effect. Normal conditions will prevail when there is not a water shortage. Conservation practices, including compliance with the *City of Vacaville Water Efficient Landscape Requirements* (WELR) will be required during normal conditions in accordance with the Municipal Code.

<u>Drought Conditions (MC 13.20.050)</u>

Drought conditions will be in effect when there is a water shortage necessitating a reduction in water use, either city-wide or in a sub-area or land-use category within the City.

<u>Emergency Conditions (MC 13.20.060)</u>

Emergency conditions will be in effect whenever there is a water shortage necessitating a reduction in water use of 50 percent or greater from the normal condition, either city-wide or in a sub-area or land-use category within the City.

## SECTION 2. Water Supply Availability

The City of Vacaville has three water supply sources. Two are surface water sources, the Solano Project and the State Water Project, that require treatment prior to distribution. The third source is from groundwater wells, which only require disinfection at the wellhead prior to distribution.

## 2.1 Solano Project Water

Vacaville's water supply sources include water from the Solano Project, which consists of Monticello Dam, Lake Berryessa, Lake Solano, and the Putah South Canal. The primary storage reservoir of the Solano Project is the Lake Berryessa reservoir, which has a large storage capacity (1.6 million acre-feet), but a relatively small watershed (576 square miles). This type of reservoir provides good drought protection if the reservoir is near full when the drought starts. Solano Project water is treated at the North Bay Regional Water Treatment Plant, a Joint Powers of Authority project between the cities of Vacaville and Fairfield, or at the City's Diatomaceous Earth Water Treatment Plant located at the City's Corporation Yard.

## 2.2 State Project Water

A second water supply source is the State Water Project, which delivers water from the Sacramento Delta through the North Bay Aqueduct. Water from the North Bay Aqueduct is treated at the North Bay Regional Water Treatment Plant. In calendar year 2014 there was a 95% percent reduction imposed on State Water Project contractors throughout California due to the extended drought of 2012 through 2014. This reduction in State Water Project supply was the most severe in the history of the State Water Project.

## 2.3 Groundwater

The third water supply source is groundwater from eleven (11) City wells. Vacaville draws groundwater from a deep aquifer located under the northeastern part of Solano County in the Vacaville/Dixon area. Vacaville's groundwater extraction in recent years has been maintained at about 5,000 - 6,000 acre feet per year (AF/YR), with the maximum safe yield determined to be over 8,000 AF/YR.

## 2.4 Supply Sources and Driest Three-Year Projection

Table 2-1 displays Vacaville's supply sources and the driest three-year period water supply projection through 2016. Total entitlements for 2014 through 2016 reflect water supply as follows:

- Groundwater - 100% of entitled amount from 2015 through 2016. Groundwater is closely monitored and managed by the member agencies of the Solano County Water Agency that utilize the groundwater resource in order to not overdraft the aquifer. Therefore groundwater should always be available at the maximum safe yield amount.
- Solano Project – Statistically, the Solano Project can deliver 89% of entitlements for multiple dry years as indicated by the 2010 UWMP. However, due to the extended drought of 2012 through 2014, and Lake Berryessa being at approximately 60% of capacity in 2014, another drought year in 2015 could result in a reduction in reliable Solano Project supply of up to 50%
- State Water NBA – The City's current contract allows for an increase in entitlements annually. In 2013 the City's entitlement was 35% of the entitled amount. This amount dropped to 5% in 2014. In multiple dry years the City's allocation is statistically projected at 30% of the normal entitlements. However, under the driest three-year scenario, which would be a continuation of the 2012-2014 drought, the State Water Project source could be unavailable in 2015 and 2016.

**TABLE 2-1 Supply Sources and Driest Three-Year Period Supply Projection (Acre - feet)**

| Source | 2013 Entitled Supply | 2013 Actual Use | 2014 Projected Supply | 2015 Projected Supply | 2016 Projected Supply |
|---|---|---|---|---|---|
| Groundwater | 8,100 | 5,236 | 8,100 | 8,100 | 8,100 |
| State Water Project | | | | | |
| Entitlement | 3,142 | 1,591 | 449 | 0 | 0 |
| Carryover | 5,836 | 5,836 | 1,654 | 0 | 0 |
| Settlement Water | - | 0 | 0 | 0 | 0 |
| Solano Project | | | | | |
| Entitlement | 5,750 | 0 | 5,750 | 5,118 | 2,815 |
| Carry Over | 21,802 | 6,405 | 24,022 | 13,681 | 7,524 |
| SID Master Agreement | 2,875 | 0 | 3,000 | 2,781 | 1,440 |
| Totals | 47,505 | 19,068 | 34,875 | 29,680 | 19,879 |

In 2014, Vacaville will balance the reduction in supply from the State Water Project by using Solano Project carryover water from previous years and slightly increasing the amount of groundwater used. The City anticipates the availability of carryover water to continue through 2016. Table 2-1 shows that even under the most extreme circumstance, the continuation of the 2012-2014 drought for two additional years, and complete unavailability of the State Water Project supply source, the City will still have adequate water supply to meet the actual water use experienced in 2013.

Should Vacaville be required to meet a more stringent reduction goal, the City has the ability to do so through the Municipal Code.

## SECTION 3. Stages of Action and Catastrophic Interruption

### 3.1 Stages of Water Conservation Actions

Vacaville has developed four (4) stages of water conservation actions, which progress from voluntary to mandatory stages. The water conservation stages and target water use reductions are shown in Table 3-1.

**TABLE 3-1 Water Conservation Stages and Reduction Targets**

| Condition | Stage | Target Demand Reduction Goal | Level of Compliance |
|---|---|---|---|
| Drought | 1 – Mild Drought | 20% | Voluntary |
| Drought | 2 – Moderate Drought | 20% | Mandatory |
| Drought | 3 – Severe Drought | 35% | Mandatory |
| Emergency | 4 – Emergency | 50% | Mandatory |

Each stage of water conservation action represents a water conservation response to a specified reduction in water supply. Each stage, when declared by the City Council, requires either a voluntary or mandatory reduction in water use by all customers, along with possible mandatory limitations on outdoor irrigation, and prohibitions on certain types of water use.

Stage 1 - Mild Drought. This stage will be declared when a reduction in total available water supply sources of 35% resulting from one or more single dry years occurs. At this stage water customers shall be asked to conserve water through a voluntary reduction in water use of 20%. Customers are also requested to limit the use of outdoor irrigation to no more than three days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

Stage 2 - Moderate Drought. This stage will be declared when a reduction in total available water supply sources of 50% resulting from one or more single dry years occurs. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 20%. Customers are also required to limit the use of outdoor irrigation to no more than four days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

Stage 3 - Severe Drought. This stage will be declared when a reduction in total available water supply sources of 65% resulting from one or more single dry years occurs. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 35%. Customers are also required to limit the use of outdoor irrigation to no more than three days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

Stage 4 - Emergency. This stage will be declared when a reduction in total available water supply sources of 75% or more resulting from an emergency drought condition, catastrophic interruption such as a natural disaster, power outage or bio-terrorism attack on the City's water treatment and distribution system. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 50%. Customers are also required to limit the use of outdoor irrigation to no more than two days per week while in this stage. Additionally, the prohibitions on water use described in Section 4 shall apply.

To verify if the target demand reduction goal has been met, water use will be reviewed on a citywide basis and compared to the goal. For example, in a Stage 2 declaration, the target water demand reduction goal is 20%. If on a citywide basis the goal is met, no further analysis is conducted and all customers are considered to have reached their goal for the specific review period.

Should the citywide goal not be met, the actual water use of each individual water customer shall then be evaluated in comparison to their base 2013 water use to confirm if they met the target water demand reduction goal. In addition to meeting the required reduction in demand, users will be required to comply with all other water use prohibitions and water waste restrictions implemented at the declared stage in accordance with Section 4.

Appeals shall be processed as set forth in Appendix C, Water Conservation Program Exception and Appeal Process.

### 3.2 Water Conservation Triggering Conditions or Events

Water conservation stages may be triggered by one or more water supply conditions or events. A significant shortage in one water supply source or moderate shortages in a combination of water supply sources may trigger a water conservation stage change at any time, as directed by City Council. The specific criteria for triggering the City's water conservation stages based on water supply shortage is shown in Table 3-2.

**TABLE 3-2 Supply Shortage Triggering Levels (Baseline Supply 47,505 AF/YR)**

| Stage | Percent Shortage | Available Supply Due to Water Shortage |
|---|---|---|
| Mild Drought | 35% Supply reduction | Combined supply reduced to 30,878 AF/YR |
| Moderate Drought | 50% Supply Reduction | Combined supply reduced to 23,752 AF/YR |
| Severe Drought | 60% Supply Reduction | Combined supply reduced to 19,002 AF/YR |
| Emergency | 75% Supply Reduction | Combined supply reduced to 11,876 AF/YR or less |

Water conservation action stages may also be triggered by local, state or federal action impacting the management of the City's water supply sources. The City Manager or his/her Designee, which will typically be the Director of Utilities or the Director of Public Works, shall use multiple sources of information to make a recommendation to the City Council on the implementation of one or more specific water conservation stages.

### 3.3 Catastrophic Interruption and Disaster Planning

The City of Vacaville developed a Utilities Department Emergency Response Plan in August 1991and has maintained and updated the plan on a regular basis, with the most recent update occurring in April 2014. The City continues to maintain a comprehensive plan which outlines the water system response plan in the event of a natural disaster, a City-wide power outage, or a bio-terrorism attack on the City's water treatment and distribution system.

The Utilities Department emergency operations center, when activated, coordinates damage surveys, gathers information, and conducts responses to the damaged processes and system. The Plan includes the following elements:

- List of water system components (wells, distribution system, storage tanks)
- Measures to be taken prior to and following an emergency event
- List of City emergency operation personnel
- Information regarding coordination with police and fire department personnel
- List of water testing laboratories, water system contractors, and pipe repair and installation contractors
- Utility service numbers for traffic signal repairs, gas and electrical repairs, and water works suppliers

In the event of a catastrophic interruption or other emergency, the City Council can direct the implementation of the Emergency stage of water conservation action.

## SECTION 4. Prohibitions on Water Use and Consumption Reduction Methods

### 4.1 Water Waste Restrictions established by Municipal Code

Section 13.20 of the Municipal Code includes specific water use restrictions. Accordingly, no user of the City's water system may knowingly make, cause, use, or permit the use of water from the system in a manner that violates the Municipal Code as cited below:

1. Excessive water runoff due to landscape irrigation activities.
2. Washing of sidewalks, driveways, walkways, parking lots, and all other hard-surfaced areas by direct hosing except for removal of hazardous materials for protection of public health and safety.
3. Washing of vehicles, equipment, structures, and other items without the use of a shutoff nozzle.

4. The escape of water through breaks or leaks within the water users' plumbing or system that is not repaired within 24 hours of discovery.
5. Fire hydrants used for purposes other than firefighting, water quality, maintenance, sanitation, and construction.

## 4.2 Additional Restrictions in Drought Stages

During Drought stages, the City Council can require additional water use restrictions as appropriate to achieve the desired level of conservation. Potential and additional restrictions include:

1. Watering and irrigation of plants, trees and landscaping will be allowed only during specified hours of the day, pursuant to regulations promulgated by the Director of Utilities.
2. Fountains and water using ornamental structures shall be prohibited from using water unless equipped with a recirculating pump.
3. Drought notices shall be posted in hotels, motels and all public establishments offering lodging.
4. Restaurants will serve water to customers only upon request of their patrons.
5. No landscaping, other than turf, may be installed unless irrigated with a drip irrigation system or a similar system with the equivalent savings in water usage.
6. Defer construction of new City parks unless specific factors determined by the City Council authorize such construction.
7. Prohibit new set-back landscaping at commercial and industrial sites. Deferred installation agreements may be required to ensure construction of the set-back landscaping when the water drought or emergency is over.

## 4.2 Additional Restrictions in Emergency Stages

In addition to normal and drought restrictions, the following additional restrictions may be enacted under emergency conditions. The City Council may also establish other water use restrictions to be in effect during an emergency condition.

1. Depending upon the severity of the water shortage, limit landscape watering to specified days only, or limit water utilization only for trees and plants watered by drip irrigation or hand-held buckets/hoses, or prohibit all irrigation completely.
2. Depending upon the severity of the water shortage, limit other outdoor water use such as, but not limited to, the washing of equipment or vehicles to specified times during the day, on specified days only, at commercial washes only where recycling of water is maintained, or prohibit all outdoor uses of water altogether.
3. Depending upon the severity of the water shortage, require all swimming pools and spas to have a cover, limit refilling of pools and spas to certain days, or prohibit the issuance of any new building permits for a pool or spa.
4. Prohibit the operation of fountains or ornamental water-using structures.
5. Prohibit the installation of turf grass.
6. Depending upon the severity of the water shortage, prohibit the construction of new golf courses and reduce or prohibit new residential construction.

During Normal water conditions, and during all water conservation stages, the City's Water Efficient Landscape Regulations shall be in effect.

Violations of any of the provisions in Section 4 may be subject to enforcement in accordance with Section 13.20.030 of the Municipal Code.

## SECTION 5. Penalties for Excessive Water Use

Under the Normal condition, water rates shall be established and modified from time to time with the objective of fully compensating for the acquisition, treatment and distribution of water through revenues collected from customers, and promoting beneficial use of the water. There are no penalties for high water use under the Normal condition.

In Drought and Emergency conditions in which a water conservation stage is declared and conservation goals set, penalties, in the form of surcharges on the water bill, may be assessed for water use in excess of the conservation goal and/or water use allocation. For any instance in which the customer's use exceeds the conservation goal and/or the water use allocation, that customer will be assessed a surcharge of 25% of the variable water charges for that billing period as a penalty for excessive water use.

## SECTION 6. Revenue and Expenditure Impacts

The City of Vacaville manages the Water Utility with the intent of maintaining revenue neutrality. The City's goal is to bill its customers only for the costs to operate and maintain an efficient water system that meets the public health requirements of its customers and promotes a high quality of life and vibrant economy.

Reductions in water use due to water conservation measures will typically result in a corresponding decrease in revenues to the Water Utility. Potential revenue reduction projections under several drought stage scenarios are shown in Table 6-1.

**TABLE 6-1 Projected Water Conservation Budget Impacts**

| | Normal 2013 Base Year | Drought (20%) | Severe Drought (35%) | Emergency (50%) |
|---|---|---|---|---|
| Water Volume Revenues | $9,912,000 | $7,930,000 | $6,443,000 | $4,956,000 |
| Reduced Revenues | | $1,982,000 | $3,469,000 | $4,956,000 |
| Additional Water Conservation Program Expenses | | $44,000 | $48,000 | $52,000 |
| Total Budget Impact | | $2,126,000 | $3,517,000 | $5,008,000 |

Once the City's water conservation reduction goal is established, the corresponding budget impact will be calculated. If revenue reductions become significant, the City Council may have to consider adjusting water rates in order to offset reductions. Any water rate adjustments considered by the City Council would be administered in accordance with the requirements of Proposition 218.

In the event additional water purchases were to become necessary, the cost for these purchases will be included as an expense and recovered through the net increase.

## SECTION 7. Water Use Monitoring Procedures

### 7.1 Normal Conditions Monitoring

In Normal stage water supply conditions, production figures are recorded daily and reviewed by the Water Operations Section. Totals are reported monthly and incorporated into the water supply report.

### 7.2 Drought Conditions Monitoring

During Drought stage water supply conditions, daily production figures are provided to the Water Operations Section of the Utility Department. The Water Operations Section provides the weekly production figures to the Water Conservation Coordinator. The Water Conservation Coordinator compares the weekly production to the 2013 base year data to verify reduction goals are being met. Weekly and monthly reports are generated and provided to the Director of Utilities. The Director of Utilities will notify the City Manager and City Council if water reduction goals are not met, so corrective action can be taken.

### 7.3 Emergency Conditions Monitoring

During an Emergency conditions shortage or interruption of service, Drought stage procedures will be followed, with the addition of a daily production report to the Director of Utilities. During a disaster shortage the Emergency stage applies.

## SECTION 8. Drought Ordinance Implementation

On November 18, 2014, the City of Vacaville adopted Drought Ordinance No. 1877 (Appendix D) establishing water conservation requirements and a water rate structure to address Normal, Drought, and Emergency conditions. Upon determination of a water shortage, or local, state, or federal declaration, the City Manager or his/her Designee shall notify the City Council of the condition along with recommendations for enactment of the appropriate conservation level.

An accompanying Resolution (No. 2014-85 – see Appendix E) was adopted declaring Drought Stage 2 conditions. Should Vacaville be required to move to Drought Stage 3 measures, a modification to Resolution 2014-85 would be prepared and submitted for Council action.

## SECTION 9. Plan Adoption Standards

The City of Vacaville updated this Urban Water Shortage Contingency Plan during July and August 2014. The Plan was adopted on August 12, 2014 (see Appendix VI). The Plan includes all information necessary to meet the requirements of California Water Code Section 10632.

The availability of draft Plan copies for review was properly noticed in the City's newspaper, and copies were available at City Offices and the Public Library.

# Appendix A

## WATER CODE
## SECTIONS 10630 and 10632

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(1) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions that are applicable to each stage.

(2) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

(3) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(4) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(5) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(6) Penalties or charges for excessive use, where applicable.

(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(8) A draft water shortage contingency resolution or ordinance.

(9) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

(b) Commencing with the urban water management plan update due December 31, 2015, for purposes of developing the water shortage contingency analysis pursuant to subdivision (a), the urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

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## A endix

## C a ter 13 20
## WA E CONSE VA ON
## N NO MAL D O G AND EME GENC COND ONS

Sections:



**13 20 010 Definitions**

As used in this chapter:

A. “Customer or account holder” means the person, corporation, agency, or other entity who owns a water meter connected to the city’s water system, and is responsible for making payment for service.

B. Drought condition. Drought conditions will be in effect when there is a water shortage necessitating a reduction in water use, either city-wide or in area or use category within the city, greater than ten percent from the normal condition but less than a thirty percent reduction.

C. Emergency Condition. Emergency conditions will be in effect whenever there is a water shortage necessitating a reduction in water use, either city-wide or in an subarea or land-use category within the city, of thirty percent or greater from the normal condition.

D. “Flow restrictor” means any device which limits the pressure or flow rate at the water service connection.

E. “General use” means all commercial, industrial, office and business water users, customers, and accounts including those condominium, apartment, multifamily, and mobile home park uses where several habitations are served by a single water meter.

F. “Irrigated metered use” means all water users, customers and accounts which either serve an agricultural use or water used for temporary construction purposes.

G. “Landscape irrigation schedule” means a schedule established which limits landscape irrigation activities to specified times of day. Specified irrigation days may also be established and irrigation times may be rotated among various users throughout the water system service area to equalize demands on the water system.

H. Normal Condition. The normal conservation condition is in effect any time when drought or emergency conditions are not in effect. Normal conditions will prevail when there is not a water shortage. Conservation practices (including the City of Vacaville Landscape Water Efficient Regulations) will be required during normal conditions in accordance with this chapter.

I. "Rate blocks" means groups of units of water supplied by the city water system and priced with an increasing block rate structure incorporating two or more blocks.

J. "Residential use" means all water users, customers and accounts except for those classified general use and metered irrigation use.

K. "Spray irrigation" means the act of applying water to landscape by sprinklers or spray nozzles.

L. Wasting Water. Wasting water includes the following activities, and except for subsection (4) below, applies whether by a water customer of the city or by any other person within the city:

1. The watering of grass, lawns, ground-cover, shrubbery, open ground, crops and trees in a manner or to an extent which allows excess water to run off of the landscaped area being watered or which results in overspray by spray irrigating facilities;

2. The washing of sidewalks, walkways, driveways, parking lots and all other hard surfaced areas by direct hosing, except as may be necessary to remove hazardous materials for protection of the public health and safety;

3. The washing of vehicles, equipment, structures and other items by direct hosing without the use of a shutoff nozzle;

4. The escape of water through breaks or leaks within the plumbing or distribution system of a user or customer of city water for any substantial period of time within which such break or leak should reasonably have been discovered and corrected. It will be presumed that up to twenty-four hours is a reasonable period after discovery of a break or leak to correct the problem.

M. "Water shortage" means any condition in which water supply is less than actual or projected water demand. Water shortages can be short term such as those caused by failure of water system infrastructure or long term such as those caused by insufficient raw water supplies.

N. "Water user or consumer" means any person, corporation, agency, or other entity that uses water from the city water system for any reason whatsoever regardless of whether the person, corporation, etc., is a customer or account holder. (Ord.1431 §4(part), 1991).

**13 20 020 Administration of ordinance**

The department of public works, through the director of public works, shall be responsible for administration of the provisions of this chapter. Wherever the term “director of public works” is used in this chapter it shall include the designee of the director of public works.

A. Monitoring. The department of public works shall monitor water supply and demand and shall determine whether a water shortage exists or is projected to exist and for determining the magnitude of such shortage.

B. Recommendation to City Council. Upon determination of a water shortage, the director of public works shall notify the city council of determination of the condition along with recommendations for enactment of drought or emergency conservation conditions beyond those set forth in this chapter. The city council will review recommendations by the director of public works and will authorize implementation of such drought or emergency conservation provisions determined necessary by the city council to address the drought or emergency condition.

C. Public Notification and Public Hearing. Before implementation, a public hearing shall be scheduled and held by the city council. The hearing shall be advertised in a newspaper of general circulation within the city at least seven days in advance of the hearing. The public shall be notified of (1) the city’s intent to implement drought or emergency conservation measures, (2) a list of proposed conservation measures or means of access thereto, and (3) the date, time and place of the public hearing.

D. Declaration of Drought or Emergency Conservation Conditions. Following the public hearing, the city council will, by resolution, determine whether a drought or emergency condition exists, the conservation provisions in addition to those set forth in this chapter to be put into effect by the department of public works during the period of the drought or emergency condition, and the water rates to be charged to water customers and users during the period of the drought or emergency condition.

E. Withdrawal of Drought and Emergency Conservation Measures. Drought or emergency conditions will continue to be in effect until the department of public works has determined that the water shortage conditions warrant change to a less restrictive conservation level and a resolution of the city council is adopted declaring a reduction in conservation levels.

F. Right of Inspection and Access to Meters. Any duly authorized representative of the city shall have the right to inspect existing and new construction for compliance with this chapter and to access the customer’s water meter for inspection and for shutting off and turning on water service for installing or removing flow restrictors.

G. Place of Use. Water received from or through a meter may be used only on and for the property served by that meter.

H. Resale of Water. Resale of water supplied by the city is prohibited.

I. Use of Reclaimed Wastewater. Use of reclaimed wastewater is exempt from the provisions of this chapter and is encouraged in place of potable water supplied by the city water system where it is feasible and within state reclamation guidelines. (Ord. 1431 §4(part), 1991).

**13 20 030 Enforcement**

It shall be a violation of this chapter for any water customer or account holder to violate any of the provisions of this chapter or of the administrative rules and regulations promulgated hereunder or to waste any water obtained from or through the distribution facilities of the city, or from any person to engage in wasting water as defined herein. The violation of each specific provision of this chapter, and each separate violation thereof, shall be deemed a separate offense, and shall be enforced accordingly.

A. Violations.

1. For the first violation within the preceding twelve calendar months, the director of public works shall issue a written notice of the fact of such violation.

2. For the second violation within the preceding twelve calendar months, the director of public works shall impose a surcharge of fifty dollars against the account holder for the property where the violation occurred.

3. For the third violation within the preceding twelve calendar months, the director of public works shall impose a surcharge of one hundred dollars against the account holder for the property where the violation occurred.

4. For a fourth and any subsequent violation within the preceding twelve calendar months, the director of public works or his designee shall impose a surcharge of two hundred fifty dollars against the account holder for the property where the violation occurred.

Further, the director of public works may:

a. Install a flow restrictor on the property where the violation occurred or is occurring, for a length of time to be determined by the director of public works, but in no event for more than one year; or

b. Disconnect service on the property where the violation occurred or is occurring, for a length of time not to exceed sixty days in length.

5. As an additional remedy, the violation of any provision of this chapter by any person who has received more than one written warning pursuant to subsection (A)(1) above or against whom the director of public works has imposed a second violation in

one consecutive twelve-month period is deemed to be and is hereby declared a public nuisance and may be subject to abatement by restraining order or injunction issued by a court of competent jurisdiction.

B. Time Period for Accounting Violations. Accrued violations will be based on acts of noncompliance occurring within a consecutive twelve-month period. Each successive twenty-four-hour period of any violation or failure to comply shall be a separate and distinct violation.

C. Notice of Violation. For each violation, the director of public works shall give notice as follows:

1. Written notice of violation will be sent through the U.S. mail, first-class prepaid, to the address of the account holder as shown on current water billing records or personally served on the account holder. The notice will be considered to have been served upon the account holder either upon depositing the notice in the U.S. mail or when personally served, whichever methodology is utilized.

2. Written notice of violation shall include the date, time, and location of the violation; a description of the violation; provisions of the ordinance violated; a statement of the assessed surcharge or other enforcement action; and the appeal procedures.

D. Right of Appeal. Any account holder provided a notice of violation in accordance with the provisions of this chapter shall have the right of appeal. A request for hearing must be made in writing and must be received by the director of public works within ten calendar days from the date of personal or mailed service of the notice of violation. Upon receipt of an appeal and request for hearing, all applicable surcharges and enforcement actions will be suspended until such hearing has been completed and a final determination made.

E. Determination of Appeal. The appeal will be heard and determined by city manager or the designee of the city manager. The city manager shall consider whether the account holder knew or should have known of the violation at the time it occurred and whether the account holder took reasonable action to correct the violation upon notification of said violation. The determination of the city manager will be final and conclusive.

F. Payment of Penalties and Charges. Any surcharge imposed pursuant to this section, or reimbursement of city expenses, shall be added to the account of the account holder for the property where the violation occurred and shall be due and payable on the same terms and subject to the same conditions as any other charge for regular water service.

G. Reimbursement of City Expenses. If violations result in either installation of a flow restrictor, discontinuation of water service, or injunctive relief sought and obtained by the city pursuant to this chapter, the account holder whose service is affected shall reimburse the city for all costs incurred, including attorney's fees.

H. Reimbursement from Tenants. Nothing in this chapter shall limit or be construed to limit the right of an account holder to seek reimbursement of a surcharge or other costs from a tenant or other consumer. (Ord. 1431 §4(part), 1991).

**13 20 040 Normal Conditions**

A. Water Conservation Goal. During normal conditions the goal is to maximize beneficial use of water through specific provisions of this chapter, public education, voluntary water conservation, and the City of Vacaville Water Efficient Landscape Regulations.

B. Implementation Methods.

1. Water Pricing. Under normal conditions, water prices shall be established and modified from time to time with the objective of fully compensating for the acquisition, treatment and distribution of water through revenues collected from customers, and promoting beneficial use of the water. Water blocks and the water rates applicable to such blocks will be established by resolution of the city council.

2. Water Use Restrictions. The City of Vacaville Water Efficient Landscape Regulations for Water Conservation be applicable and water wasting activities shall be prohibited under normal conditions.

3. Irrigated Metered Use. No water may be supplied for temporary construction purposes without a permit from the department of public works and payment of the costs of such water as determined by the city council by resolution. Other than water released by the city itself for public purposes, no water may be taken from a fire hydrant without a permit from the city, payment of water charges as required, and the use of metering and backflow prevention devices. (Ord.1431 §4(part), 1991).

**13 20 050 Droug t Conditions**

A. Water Conservation Goal. During drought conditions the goal is to achieve from a ten percent to a thirty percent reduction in water consumption compared with normal conditions.

B. Implementation Methods.

1. Water Pricing. Under drought conditions, water prices may be adjusted by any combination of (a) increases in the unit prices of water for established blocks, (b) modification of the unit amounts which define blocks, and (c) addition of new blocks. Under drought conditions, it will be necessary to increase price to balance cost to the City with revenues collected from customers as a result of lower water use, to acquire

additional or supplemental supplies of water, or to promote water conservation. Changes in water pricing for drought conditions shall be made by a resolution of the city council.

2. Water Allotment. The water units which define the block structure price stages may be set from time to time by the city council by resolution on either an annual or seasonal basis, and reduced by the percent decrease necessary to achieve the conservation goal for residential use, general use and metered irrigation use. The director of public works is authorized to promulgate regulations to implement the allocations established by the city council and address those situations in which circumstances warrant a modification of the allocation.

3. Water Use Restrictions. In addition to normal restrictions in this chapter, the following restrictions shall be applicable under drought conditions. Further, the city council may direct, by resolution, additional restrictions.

a. Watering and irrigation of plants, trees and landscaping will be allowed only during specified hours of the day, pursuant to regulations promulgated by the director of public works.

b. Fountains and water-using ornamental structures shall be prohibited from using water unless equipped with a recirculation pump.

c. Drought notices shall be posted in hotels, motels and all public establishments offering lodging.

d. Restaurants will serve water to customers only upon request of their patrons.

e. No landscaping, other than turf, may be installed unless irrigated with a drip irrigation system or a similar system with the equivalent savings in water usage.

f. Defer construction of new city parks unless specific factors determined by the city council authorize such construction.

g. Prohibit new set-back landscaping at commercial and industrial sites. Deferred installation agreements may be required to ensure construction of the setback landscaping when the water drought or emergency is over. (Ord.1431 §4(part), 1991).

**13 20 060 Emergenc   Condition**

A. Water Conservation Goal. During emergency conditions the goal is to achieve a thirty percent or greater reduction in water consumption compared with normal conditions.

B. Implementation Methods.

1. Water Pricing. Under emergency conditions, water prices may be further adjusted as set forth in Section 13.20.050(b)(1) herein.

2. Water Allotment. Under emergency conditions, water unit amounts which defined the block structure price increase stages can be further adjusted, as set forth in Section 13.20.050(B)(1) and as determined necessary by the city council, by resolution, to maintain revenues and decrease water consumption.

3. Water Use Restrictions. In addition to normal and drought restrictions, the following additional restrictions may be enacted under emergency conditions. Further, the city council may establish, by resolution, other water use restrictions to be in effect during an emergency condition.

a. Depending upon the severity of the water shortage, prohibit landscape watering to specified days only, or limit to only utilization of water for trees and plants watered by drip irrigation or hand-held buckets/hoses, or prohibit all irrigation completely;

b. Depending upon the severity of the water shortage, prohibit other outdoor water use such as, but not limited to, the washing of equipment or vehicles to specific times during the day, on specified days only, at commercial washes only where recycling of water is maintained, or to prohibit all outdoor use of water altogether;

c. Depending upon the severity of the water shortage, require all swimming pools and spas to have a cover, limit refilling of pools and spas to certain days, or prohibit the issuance of any new building permits for a pool or spa;

d. Prohibit the operation of fountains or ornamental water using structures;

e. Prohibit the installation of turf grass;

f. Depending upon the severity of the water shortage, prohibit the construction of new golf courses and reduce or prohibit new residential construction. (Ord. 1431 §4(part),1991).

**A endix C**

Policy and Procedure
Date issued: Date
revised: Section:

**S EC Water Conservation rogram**
**Exce tion and A eal rocess**

Approved:David Tompkins Assistant
Director of Public Works

1.0 PURPOSE

To provide a systematic means for processing water conservation exceptions to Conservation the city of Vacaville's Water Ordinance. To approvals and denials. insure consistent application of

2.0 DEFINITION

During Drought and Emergency water conditions as adopted by Resolution of the City Council of the City of Vacaville, water use goals are established. Water customers in the City of Vacaville may apply for additional water above that goal based upon: (1)having more than four (4)residents per household in case an additional 50 which gallons per day per person will be granted to such household but not to exceed an additional 100 gallons per day per household, (2) due to medical requirements, (3) due to severe economic hardship, (4) due to emergency conditions, (5) for livestock or (6) other extenuating circumstances as determined by the Director of Utilities.

3.0 POLICY

3.1 Additional water units will be granted based on the following guidelines:

3.1.1 More than four (4) residents per household: 50 gallons per day (4 units) per person not to exceed an additional 100 gallons per day per household.

3.1.2 Medical requirements: Determined on a case-by-case basis based on customer description of water usage for medical needs. Generally allotted in multiples of four (4) units (50 gallons per day).

3.1.3 Severe economic hardship: Twelve (12) units or 150 gallons per day.

3.1.4 Emergency conditions: Determined on a case-by-case basis based on customer description of water usage for emergency needs.

3.1.5 Large livestock (horse, cattle, sheep): 30 gallons per large animal per day.

3.1.6 Residential Use-Home Based Businesses

a) Daycare - two (2)units or 25 gallons per day per daycare child.

b) Water Usage Business (eg, painting, etc) janitorial, per - Four (4) units or 50 gallons day.

c) Non-water usage business (eg, office, etc) instructional classes, gallons per - Two units or 25 day.

3.1.7 General Use - Extenuating Circumstances

Determined on a case-by-case basis based on customer description of type of business, water needs, usage history, etc.

3.1.8 Residential Use - Extenuating Circumstances

Determined on a case-by-case basis based on customer description on type of business, water needs, usage history, etc.

3.2 Right of Appeal- Any account holder provided a denial of exception or a goal amount less than they deem necessary shall have the right of appeal.

3.1.1 More than four {4) residents per household: 50 gallons per day (4 units) per person not to exceed an additional 100 gallons per day per household.

3.1.2 Medical requirements: Determined on a case-by-case basis based on customer description of water usage for medical needs. Generally allotted in multiples of four (4) units (50 gallons per day).

3.1.3 Severe economic hardship: Twelve (12) units or 150 gallons per day.

3.1.4 Emergency conditions: Determined on a case-by-case basis based on customer description of water usage for emergency needs.

3.1.5 Large livestock (horse, cattle, sheep): 30 gallons per large animal per day.

3.1.6 Residential Use- Home Based Businesses

a) Daycare - two (2) units or 25 gallons per day per daycare child.

b) Water Usage Business (eg, painting, etc) janitorial, per - Four (4) units or 50 gallons day.

c) Non-water usage business (eg, office, etc) instructional classes, gallons per - Two units or 25 day.

3.1.7 General Use- Extenuating Circumstances

Determined on a case-by-case basis based on customer description of type of business, water needs, usage history, etc.

3.1.8 Residential Use - Extenuating Circumstances

Determined on a case-by-case basis based on customer description on type of business, water needs, usage history, etc.

3.2 Right of Appeal- Any account holder provided a denial of exception or a goal amount less than they deem necessary shall have the right of appeal.

A request for appeal must be made in writing and received by the Assistant Director of Utilities. The appeal will be considered with a determination made by the Assistant Director of Utilities, who shall consider the circumstances of the appealing customer, the status of the City's water supply, and whether reasonable action is being taken on the part of the account holder to conserve water. A written response will be forwarded to the account holder upon determination.

Should the account holder request further considerations after the above mentioned steps have been completed and a determination issued; those steps may be repeated to the Director of Utilities whose determination will be final and conclusive.

3.3 All efforts will be made to insure strict confidentiality of Water Conservation Exception Forms and the identity of any account holder who submits said forms.

4.0 PROCEDURE

Water Conservation Exception Forms are available through the Water Conservation Office and can be submitted at anytime throughout the duration of Drought and Emergency conditions.

All efforts will be made to process the Exception Forms in a timely manner.

Completed forms will be copied and forwarded to the Finance Department for computerized account input. Original forms will remain at the Water Conservation Office. Copied forms will be shredded.

Account holders will be notified of denial or of additions to goal amounts.

5.0 RESPONSIBILITY

It is the responsibility of the Water Conservation Coordinator to maintain all documents pertaining to the exception process and to insure consistent application of this policy and procedure.

Attachments:

(1) Water Conservation Exception Form Residential Use Classification

(2) Water Conservation Exception Form - General Use Classification

CITY OF VACAVILLE

WATER ALLOTMENT EXCEPTION FORM

General Use Classification

This form must be completed in full and submitted for additional allotments of water or for water use contrary to the adopted Water Conservation Ordinance. Please mail the completed form to: City of Vacaville, Water Conservation Office, PO Box 220, Elmira, CA 95625. Must be received on or before the date shown below in order to be in effect by your next billing. The decision of the Director of Utilities is final. You will receive a prompt reply. For additional information, call the Water Conservation Hotline at 469-6555.

The ordinance allows exceptions to water allotment based on the following reasons only. Circle which exception applies to you and explain below.

(a) Medical requirements
(b) When failure to do so would cause severe economic hardship to the applicant including, but not limited to, threat of imminent insolvency
(c) When failure to do so would cause an emergency condition affecting the health, sanitation, fire protection or safety of applicant/public
(d) Large livestock (i.e., horses and cattle)
(e) Serious extenuating circumstances

Describe why one or more of the above exceptions apply to you. The Director of Utilities or his/her designee can grant your request only upon clear and convincing evidence that one or more of the foregoing conditions have been satisfied. (Additional space on back).

____________________________________________________________

____________________________________________________________

I hereby declare, under penalty of perjury, that the above information is true and correct. Water bills are calculated on information provided. If information is inaccurate, the customer will be responsible for retroactive full and proper payment.

Print Name ______________________ Signature ______________________ Date ____________

Telephone Number ______________________

CITY OF VACAVILLE
WATER CONSERVATION EXCEPTION FORM
Residential Use
Classification

This form must be completed in full and submitted for an increase to the standard conservation goal or for water use contrary to the adopted Water Conservation Ordinance. Please mail the completed form to: City of Vacaville, Water Conservation Office, P.O. Box 220, Elmira, CA 95625. The decision of the Director of Utilities is final. You will receive a prompt reply. For additional information, call the Water Conservation Hotline at 469-6555.

Name and Address                                                                 Account Number:

The ordinance allows exceptions to the standard conservation goal based on the following reasons only. Check which applies to you and explain below.

A. More than 4 residents in a single family residential household.
   1. I am requesting an exception to the standard conservation goal for _____(#) of people who permanently
   2. Reside here for more than 6 months per year.
   3. List all permanent residents by name and birth date. (Additional space on back).

______________________ ______________________ ______________________

______________________ ______________________ ______________________

B. Medical requirements. (Explain in space below)
C. When failure to do so would cause severe economic hardship to the applicant including, but not limited to, threat of imminent insolvency
D. When failure to do so would cause an emergency condition affecting the health, sanitation, fire protection or safety of applicant/public
E. Large livestock (i.e., horses and cattle)
F. Serious extenuating circumstances
G. Home based business which requires additional water.
   1. Business license number:
   2. Type of Business:

Describe why one or more of the above exceptions apply to you. The Director of Utilities or his designee can grant your request only upon clear and convincing evidence that one or more of the foregoing conditions have been satisfied. Include if applicable: # of employees, business size and hours, # of work stations, if daycare # of children provided services, etc. (Additional space on back)

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

I hereby declare, under penalty of perjury, that the above is true and correct.

______________________ ______________________________________________

Print Name                    Signature                    Date

______________________

Telephone Number

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# ORDINANCE NO. 1431

## AN URGENCY ORDINANCE OF THE CITY OF VACAVILLE ESTABLISHING WATER CONSERVATION REQUIREMENTS AND WATER RATE STRUCTURES TO ADDRESS NORMAL, DROUGHT AND EMERGENCY CONDITIONS

THE CITY COUNCIL OF THE CITY OF VACAVILLE DOES ORDAIN AS FOLLOWS:

## SECTION 1. URGENCY FINDINGS

The City council of the City of Vacaville finds as follows:

1. The State of California is facing unprecedented drought conditions which have resulted in reductions of water entitlements to the city of Vacaville and proposed additional reductions. The Governor of the State of California, the State Water Resources Control Board and the Federal Bureau of Reclamation have either ordered cutbacks of water allocations to the city of Vacaville or have announced their intention to do so in the immediate future. At present the State Department of Water Resources has reduced Vacaville's 1991 water entitlement from the State Water Project's North Bay Aqueduct by 90%, which represents about 6% of the City's total annual water supply for 1991. The Federal Bureau of Reclamation has required the City to reduce its releases from the Solano Project by 25%, which represents about 10% of the City's total water supply for 1991. The Governor has directed that each public agency develop a plan and implement procedures to reduce water usage by 50%.

2. The State Legislature has also enacted legislation to address drought conditions including, among others, Water Code sections 350-359 establishing requirements for declaration and implementation of water shortage emergency conditions. Assembly Bill 325 requiring preparation of landscape regulations, and section 17921.3 of the Health and Safety Code pertaining to plumbing standards for water closets and urinals.

3. Limited water supplies, both regionally and to the City, create additional obligations to put those limited water resources available to the maximum beneficial use to the extent possible. Maximizing beneficial use includes elimination of waste or unreasonable use of water while protecting the interests of the people of the City of Vacaville and for the protection of the public health safety, and welfare.

4. In order for the city of Vacaville to (1) achieve the presently mandated reduction of 15 of its 1991 water supply and to implement methods to be able to achieve a reduction in water use by 50%, should that become necessary, and (2) to preserve and protect the limited water supplies available to the city of Vacaville for residential use, human consumption, public sanitation and maintenance of business and commercial facilities, it is imperative that water conservation measures, including pricing mechanisms to reduce water consumption, be put in place immediately on an urgency basis.

SECTION 2. COORDINATION WITH PRESENT MUNICIPAL CODE

The provisions of this Ordinance shall prevail over conflicting sections of the existing Vacaville Municipal Code, if any.

SECTION 3. APPLICABILITY

The provisions of this ordinance shall apply to all Water Users served by the City of Vacaville water system. No Water User of the City of Vacaville water system shall knowingly make, cause, use, or permit the use of water from the City water system for residential, commercial, industrial, agricultural, institutional, or any other purpose in a manner contrary to any provisions of this Ordinance.

SECTION 4.

Chapter 13.20 of the Vacaville Municipal Code is added to read as follows:

CHAPTER 13.20
WATER CONSERVATION IN
NORMAL, DROUGHT AND EMERGENCY CONDITIONS

Section 13.20.010. Definitions:

(A). Wasting Water. Wasting water includes the following activities, and except for subsection (d) below, applies whether by a water customer of the City of Vacaville or by any other person within the City of Vacaville:

(1) The watering of grass, lawns, ground-cover, shrubbery, open ground, crops and trees in a manner or to an extent which allows excess water to run off of the landscaped area being watered or which results in overspray by Spray Irrigation facilities.

(2) The washing of sidewalks, walkways, driveways, parking lots and all other hard surfaced areas by direct hosing, except as may be necessary to remove hazardous materials for protection of the public health and safety.

(3) The washing of vehicles, equipment, structures and other items by direct hosing without the use of a shutoff nozzle.

(4) The escape of water through breaks or leaks within the plumbing or distribution system of a user or customer of City water for any Substantial period of time within which such break or leak should reasonably have been discovered and corrected. It will be presumed that up to 24 hours is a reasonable period after discovery of a break or leak to correct the problem.

(B). Customer or Account Holder. A Customer or Account Holder is the person, corporation, agency, or other entity who owns a water meter connected to the City's water system, and is responsible for making payment for service.

(C). Water User or Consumer. A Water User or Consumer is any person, corporation, agency, or other entity who uses water from the city water system for any reason whatsoever regardless of whether the person, corporation, etc., is a customer or Account Holder.

(D). Flow Restrictor. A Flow Restrictor is any device which limits the pressure or flow rate at the water service connection.

(E). Spray Irrigation. Spray Irrigation is the act of applying water to landscape by sprinklers or spray nozzles.

(F). Water Shortage. A Water Shortage is defined as any condition in which water supply is less than actual or projected water demand. Water shortages can be short term such as those caused by failure of water system infrastructure or long term such as those caused by insufficient raw water supplies.

(G). Rate Blocks. Groups of units of water supplied by the City water system and priced with an increasing block rate structure incorporating two or more blocks.

(H). Landscape Irrigation Schedule. A schedule established which limits landscape irrigation activities to specified times of day. Specified irrigation days may also be established and irrigation times may be rotated among various users throughout the water system service area to equalize demands on the water system.

(I). Normal Condition. The normal conservation condition is in effect any time when drought or emergency conditions are not in effect. Normal conditions will prevail when there is not a Water Shortage. Conservation practices (including the of the City of Vacaville Landscape water Efficient Regulations) will be required during normal conditions in accordance with this ordinance.

(J). Drought Condition. Drought conditions will be in effect when there is a Water Shortage necessitating a reduction in water use, either city-wide or in area or use category within the City, greater than 10% from the Normal Condition but less than a 30% reduction.

(K). Emergency Condition. Emergency conditions will be in effect whenever there is a Water Shortage necessitating a reduction in water use, either city-wide or in an sub-area or land-use category within the City, of 30% or greater from the Normal Condition.

(L). Residential Use. All water users, customers and accounts except for those classified General Use and Metered Irrigation Use.

(M). General Use. All commercial, industrial, office and business water users, customers, and accounts including those condominium, apartment, multi-family, and mobile home park uses where several habitations are served by a single water meter.

(N). Irrigated Metered Use. All water users, customers and accounts which either serve an agricultural use or water used for temporary construction purposes.

Section 13.20.020 Administration of Ordinance:

The Department of Public Works, through the Director of Public Works, shall be responsible for administration of the provisions of this Chapter. Wherever the term "Director of Public Works" is used in this Chapter it shall include the designee of the Director of Public Works.

(A). Monitoring. The Department of Public Works shall monitor water supply and demand and shall determine whether a Water Shortage exists or is projected to exist and for determining the magnitude of such shortage.

(B). Recommendation to City Council. Upon determination of a water Shortage, the Director of Public Works shall notify the city Council of determination of the condition along with recommendations for enactment of drought or emergency conservation conditions beyond those set forth in this chapter. The City Council will review recommendations by the Director of Public Works and will authorize implementation of such drought or emergency conservation provisions determined necessary by the City Council to address the drought or emergency condition.

(C). Public Notification and Public Hearing. Before implementation, a public hearing shall be scheduled and held by the City Council. The hearing shall be advertised in a newspaper of general circulation within the City of Vacaville at least seven days in advance of the hearing. The public shall be notified of 1) the City's intent to implement drought or emergency conservation measures, 2) a list of proposed conservation measures or means of access thereto, and 3) the date, time and place of the public hearing.

(D). Declaration of Drought or Emergency Conservation Conditions. Following the public hearing, the City Council will, by resolution, determine whether a drought or emergency condition exists, the conservation provisions in addition to those set forth in this Chapter to be put into effect by the Department of Public Works during the period of the drought or emergency condition, and the water rates to be charged to water customers and users during the period of the drought or emergency condition.

(E). withdrawal of Drought and Emergency Conservation Measures. Drought or Emergency conditions will continue to be in effect until the Department of Public Works has determined that the Water Shortage conditions warrant change to a less restrictive conservation level and a resolution of the. City Council is adopted declaring a reduction in conservation levels.

(F). Right of Inspection and Access to Meters. Any duly authorized representative of the City shall have the right to inspect existing and new construction for compliance with this Ordinance and to access the Customer's water meter for inspection and for shutting off and turning on water service for installing or removing Flow Restrictors.

(G). Place of Use. Water received from or through a meter may be used only on and for the property served by that meter.

(H). Resale of Water. Resale of water supplied by the City of Vacaville is prohibited.

(I). Use of Reclaimed Wastewater. Use of reclaimed wastewater is exempt from the prov1s10ns of this Ordinance and is encouraged in place of potable water supplied by the City water system where it is feasible and within state reclamation guidelines.

Section 13.20.030 Enforcement:

It shall be a violation of this Chapter for any water customer or account holder to violate any of the provisions of this Chapter or of the administrative rules and regulations promulgated hereunder or to waste any water obtained from or through the distribution facilities of the City, or for any person to engage in wasting water as defined herein. The violation of each specific provision of this Chapter, and each separate violation thereof, shall be deemed a separate offense, and shall be enforced accordingly.

(A). Violations:

(1) For the first violation within the preceding twelve (12) calendar months, the Director of Public Works shall issue a written notice of the fact of such violation.

(2) For the second violation within the preceding twelve (12) calendar months, the Director of Public Works shall impose a surcharge of $50.00 against the account holder for the property where the violation occurred.

(3) For the third violation within the preceding twelve (12) calendar months, the Director of Public Works shall impose a surcharge of $100.00 against the account holder for the property where the violation occurred.

(4) For a fourth and any subsequent violation within the preceding twelve (12) calendar months, the Director of Public Works or his designee shall impose a surcharge of $250.00 against the account holder for the property where the violation occurred. Further, the Director of Public Works may:

(a) install a flow restrictor on the property where the violation occurred or is occurring, for a length of time to be determined by the Director of Public Works, but in no event for more than one (1) year; or

(b) disconnect service on the property where the violation occurred or is occurring, for a length of time not to exceed sixty (60) days in length.

(5) as an additional remedy, the violation of any provision of this Chapter by any person who has received more than one written warning pursuant to section (1) above or against whom the Director of Public Works has imposed a second violation in one consecutive

twelve-month period is deemed to be and is hereby declared a public nuisance and may be subject to abatement by restraining order or injunction issued by a court of competent jurisdiction.

(B). Time Period for Accounting Violations. Accrued violations will be based on acts of non-compliance occurring within a consecutive twelve (12) month period. Each successive twenty-four hour period of any violation or failure to comply shall be a separate and distinct violation.

(C). Notice of Violation. For each violation, the Director of Public Works shall give notice as follows:

(1) Written notice of violation will be sent through the US mail, first class pre-paid, to the address of the account holder as shown on current water billing records or personally served on the account holder. The notice will be considered to have been served upon the account holder either upon depositing the notice in the US mail or when personally served, whichever methodology is utilized.

(2) Written notice of violation shall include the date, time, and location of the violation; a description of the violation; provisions of the ordinance violated; a statement of the assessed surcharge or other enforcement action; and the appeal procedures.

(D). Right of Appeal. Any account holder provided a notice of violation in accordance with the provisions of this Ordinance shall have the right of appeal. A request for hearing must be made in writing and must be received by the Director of Public Works within ten (10) calendar days from the date of personal or mailed service of the notice of violation. Upon receipt of an appeal and request for hearing, all applicable surcharges and enforcement actions will be suspended until such hearing has been completed and a final determination made.

(E). Determination of Appeal. The appeal will be heard and determined by city Manager or the designee of the City Manager. The City Manager shall consider whether the account holder knew or should have known of the violation at the time it occurred and whether the account holder took reasonable action to correct the violation upon notification of said violation. The determination of the City Manager will be final and conclusive.

(F). Payment of Penalties and Charges. Any surcharge imposed pursuant to this section, or reimbursement of city expenses, shall be added to the account of the account holder for the property where the violation occurred and shall be due and payable on the same terms and subject to the same conditions as any other charge for regular water service.

(G). Reimbursement of City Expenses. If violations result in either installation of a flow restrictor, discontinuation of water service, or injunctive relief sought and obtained by the City pursuant to this chapter, the account holder whose service is affected shall be reimburse the City for all costs incurred, including attorney's fees.

(H). Reimbursement from Tenants. Nothing in this Ordinance shall limit or be construed to limit the right of an account holder to seek reimbursement of a surcharge or other costs from a tenant or other consumer.

Section 13.20.040 Normal Conditions

(A). Water Conservation Goal. During normal conditions the goal is to maximize beneficial use of water through specific provisions of this Ordinance, public education, voluntary water conservation, and the City of Vacaville Water Efficient Landscape Regulations.

(B). Implementation Methods

(1) Water Pricing

Under normal conditions, water prices shall be established and modified from time to time with the objective of fully compensating for the acquisition, treatment and distribution of water through revenue collected from customers, and promoting beneficial use of the water. Water blocks and the water rates applicable to such blocks will be established by resolution of the City council.

(2) Water Use Restrictions

The City of Vacaville Water Efficient Landscape Regulations for Water Conservation be applicable and water wasting activities shall be prohibited under normal conditions.

(3) Irrigated Metered Use

No water may be supplied for temporary construction purposes without a permit from the Department of Public Works and payment of the costs of such water as determined by the city Council by resolution. Other than water released by the City itself for public purposes, no water may be taken from a fire hydrant without a permit from the City, payment of water charges as required, and the use of metering and backflow prevention devices.

Section 13.020.050 Drought Conditions

(A). Water Conservation Goal. During drought conditions the goal is to achieve from a 10% to a 30 percent reduction in water consumption compared with normal conditions.

(B). Implementation Methods

(1) Water Pricing

Under drought conditions, water prices may be adjusted by any combination of 1) increases in the unit prices of water for established blocks, 2) modification of the unit amounts which define blocks, and 3) addition of new blocks. Under drought conditions, it will be necessary to increase price to balance cost to the City with revenues collected from customers as a result of lower water use, to acquire additional or supplemental supplies of water, or to promote water conservation. Changes in water pricing for drought conditions shall be made by a resolution of the City Council.

(2) Water Allotment

The water units which define the block structure price stages may be set from time to time by the city Council by resolution on either an annual or seasonal basis, and reduced by the percent decrease necessary to achieve the conservation goal for Residential Use, General Use and Metered Irrigation Use. The Director of Public Works is authorized to promulgate regulations to implement the allocations established by the city Council and address those situations in which circumstances warrant a modification of the allocation.

(3). Water Use Restrictions

In addition to normal restrictions in this Chapter, the following restrictions shall be applicable under drought conditions. Further, the City Council may direct, by resolution, additional restrictions.

(a) watering and irrigation of plants, trees and landscaping will be allowed only during specified hours of the day, pursuant to regulations promulgated by the Director of Public Works.

(b) fountains and water using ornamental structures shall be prohibited from using water unless equipped with a recirculating pump.

(c) drought notices shall be posted in hotels, motels and all public establishments offering lodging.

(d) restaurants will served water to customers only upon request of their patrons.

(e) no landscaping, other than turf, may be installed unless irrigated with a drip irrigation system or a similar system with the equivalent savings in water usage.

(f) defer construction of new city parks unless specific factors determined by the City Council authorize such construction.

(g) prohibit new set-back landscaping at commercial and industrial sites. Deferred installation agreements may be required to ensure construction of the set-back landscaping when the water drought or emergency is over.

Section 13.20.060 Emergency Condition

(A). Water Conservation Goal. During emergency conditions the goal is to achieve a 30.percent or greater reduction in water consumption compared with normal conditions •.

(B). Implementation Methods

(1) Water Pricing

Under emergency conditions, water prices may be further adjusted as set forth in section 13.20.050 (B) (1) herein.

(2) Water Allotment

Under emergency conditions, water unit amounts which define the block structure price increase stages can be further adjusted, as set forth in section 13.020.050 (B)(1) and as determined necessary by the city Council, by resolution, to maintain revenues and decrease water consumption.

(3) Water Use Restrictions

In addition to normal and drought restrictions, the following additional restrictions may be enacted under emergency conditions. Further, the City Council may establish, by resolution, other water use restrictions to be in effect during an emergency condition.

(a) depending upon the severity of the water shortage, prohibit landscape watering to specified days only, or limit to only utilization of water for trees and plants watered by drip irrigation or hand-held buckets/hoses, or prohibit all irrigation completely.

(b) depending upon the severity of the water shortage, prohibit other outdoor water use such as, but not limited to, the washing of equipment or vehicles to specified times during the day, on specified days only, at commercial washes only where recycling of water is maintained, or to prohibit all outdoor uses of water altogether.

(c) depending upon the severity of the water shortage, require all swimming pools and spas to have a cover, limit refilling of pools and spas to certain days, or prohibit the issuance of any new building permits for a pool or spa.

(d) prohibit the operation of fountains or ornamental water using structures.

(e) prohibit the installation of turf grass.

(f) depending upon the severity of the water shortage, prohibit the construction of new golf courses and reduce or prohibit new residential construction.

SECTION 5. SEVERABILITY

If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason held to be unenforceable or invalid, such decision shall not affect the validity of the remaining portions of this Ordinance. It is intended that each portion of this Ordinance would have been adopted irrespective of the fact that anyone or more sections, subsections, sentences, clauses or phrases be declared unenforceable or invalid.

SECTION 6. PUBLICATION

This ordinance shall be published once, within fifteen (15) days after its adoption, in the Vacaville Reporter, a newspaper of general circulation in the city of Vacaville.

I HEREBY CERTIFY that this urgency ordinance was introduced and adopted at a regular meeting of the City Council of the City of Vacaville, held on the 12th day of March, 1991, and effective March 13, 1991, by the following vote:

| | |
|---|---|
| AYES: | Councilmembers Clancy, Conner, Lowe,<br>Vice Mayor Kimme, and Mayor Fleming |
| NOES: | None |
| ABSENT: | None |

APPROVED

_________________________

David A. Fleming, Mayor

ATTEST:

_________________________

Kathleen M. Andronico, City Clerk

**RESOLUTION NO. 2014-085**

**RESOLUTION DECLARING A DROUGHT CONDITION AND DIRECTING STAFF TO IMPLEMENT WATER CONSERVATION ACTIONS AT STAGE 2 – MODERATE DROUGHT OF THE 2014 CITY OF VACAVILLE URBAN WATER SHORTAGE CONTINGENCY PLAN**

**WHEREAS**, on January 17, 2014, Governor Edmund G. Brown, Jr. declared a Drought State of Emergency throughout California after three consecutive years of extremely low precipitation; and

**WHEREAS,** on April 25, 2014, Governor Brown signed an Executive Order authorizing the State Water Resources Control Board to adopt emergency regulations as it deemed necessary to reduce water use statewide; and

**WHEREAS,** on July 15, 2014, the State Water Resources Control Board adopted emergency regulations adding new sections to Title 23 of the California Code of Regulations requiring urban water suppliers to implement certain water conservation actions, including implementation of the stage of the urban water supplier's Urban Water Shortage Contingency Plan that includes restrictions on the irrigation of ornamental landscaping and lawns, to reduce urban water use; and

**WHEREAS,** on August 12, 2014, the City Council adopted the August 2014 update to the Urban Water Shortage Contingency Plan, last revised in 1991, to include all of the required elements to meet the new regulations adopted by the State Water Resources Control Board.

**NOW, THEREFORE, BE IT RESOLVED** by the City Council of the City of Vacaville that a Drought Condition is declared in Vacaville.

**BE IT FURTHER RESOLVED** by the City Council of the City of Vacaville that City staff is directed to implement Stage 2 – Moderate Drought of the August 2014 update to the Urban Water Shortage Contingency Plan, with a mandatory twenty percent (20%) reduction in water use and limiting the irrigation of outdoor ornamental landscaping and lawns to 4 days per week.

**BE IT FURTHER RESOLVED** by the City Council of the City of Vacaville that all fines and penalties described in the August 2014 update to the Urban Water Shortage Contingency Plan shall be waived for the next 2 utility billing cycles.

**I HEREBY CERTIFY** that the forgoing resolution was introduced and passed at a regular meeting of the City Council of the City of Vacaville, held on the 26th day of August, 2014 by the following vote:

AYES: Council members Hunt, Rowlett, Vice-Mayor Mashburn and Mayor Hardy

NOES: None

ABSENT: Council member Harris

ATTEST:

Michelle A. Thornbrugh

Michelle A. Thombrugh, City Clerk

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# RESOLUTION NO. 2014-076

## RESOLUTION ADOPTING THE UPDATE TO THE CITY OF VACAVILLE URBAN WATER SHORTAGE CONTINGENCY PLAN IN RESPONSE TO EMERGENCY DROUGHT REGULATIONS ADOPTED BY THE STATE WATER RESOURCES CONTROL BOARD ON JULY 15, 2014

**WHEREAS,** on January 17, 2014, Governor Edmund G. Brown, Jr. declared a Drought State of Emergency throughout California after three consecutive years of extremely low precipitation; and

**WHEREAS,** on April 25, 2014, Governor Brown signed an Executive Order authorizing the State Water Resources Control Board to adopt emergency regulations as it deemed necessary to reduce water use statewide; and

**WHEREAS,** on July 15, 2014, the State Water Resources Control Board adopted emergency regulations adding new sections to Title 23 of the California Code of Regulations requiring urban water suppliers to implement certain water conservation actions, including implementation of the urban water supplier's Urban Water Shortage Contingency Plan, to reduce urban water use; and

**WHEREAS,** the City of Vacaville has updated the Urban Water Shortage Contingency Plan, last revised in 1991, to include all of the required elements to meet the new regulations adopted by the State Water Resources Control Board.

**NOW, THEREFORE, BE IT RESOLVED** by the City Council of the City of Vacaville that the August 2014 update to the Urban Water Shortage Contingency Plan is hereby adopted.

**I HEREBY CERTIFY** that the forgoing resolution was introduced and passed at a regular meeting of the City Council of the City of Vacaville, held on the 12th day of August, 2014 by the following vote:

| | |
|---|---|
| AYES: | Council members Harris, Hunt, Rowlett and Vice-Mayor Mashburn |
| NOES: | None |
| ABSENT: | Mayor Hardy |

ATTEST:

Michelle A. Thornbrugh, City Clerk

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# APPENDIX F

# SCWA WATER SUPPLY RELIABILITY TECHNICAL MEMORANDUM

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14 April 2016

# Technical Memorandum

To: Thomas Pate, Solano County Water Agency

From: Jennifer Lau, Kennedy/Jenks Consultants

CC: Sachi Itagaki and Mary Lou Cotton, Kennedy/Jenks Consultants

Subject: SCWA Water Supply Reliability
K/J 1568025*00

## Introduction

This Technical Memorandum is part of Task 3A of the Solano County Water Agency (SCWA) Strategic Plan Update to provide technical support for the SCWA Participating Agencies to address water supply reliability for their 2015 Urban Water Management Plans. This Technical Memorandum provides:

- A review of 2015 California Department of Water Resources (DWR) State Water Project (SWP) Delivery Capability Report (DCR) for applicable delivery reliability assumptions, particularly for SCWA.

- A review and summary of Solano Project Reliability.

SCWA supplies untreated water from the Solano Project and the State Water Project for agriculture, and municipal and industrial uses. SCWA Participating Agencies that are also urban water suppliers include:

- City of Benicia
- City of Dixon
- City of Fairfield
- City of Rio Vista
- Suisun City
- City of Vacaville
- City of Vallejo

## State Water Project Supply

SCWA has a long-term water master water supply contract with DWR for water supply from the State Water Project that currently expires in 2035 but is renewable. SCWA is a North of Delta SWP Contractor and receives SWP water via the North Bay Aqueduct, which is owned and operated by DWR to deliver wholesale water supply for municipal and industrial uses from the Barker Slough Pumping Plant in the Sacramento-San Joaquin Delta to Napa and Solano Counties. SCWA's contract with DWR includes a maximum allocation of 47,756 acre-feet per year (AFY), known as Table A water. Supplemental SWP water, “Advanced Table A” (ATA), under specific conditions, is available to SCWA under specific conditions. Additional supplemental water, Settlement Water (SW), is also available from year to year with some restrictions.

## State Water ro ect Ca a ilit e ort

DWR prepares a biennial report to assist SWP contractors assess the availability of supplies from the SWP. The most recent update, the 2015 DWR State Water Project DCR was finalized in July 2015. In this 2015 update, DWR provides SWP supply estimates for SWP contractors to use in their planning efforts, including for use in their 2015 UWMPs. The 2015 DCR includes DWR’s estimates of SWP water supply availability under both current and future conditions. Further details on modeling assumptions can be found in the DCR and its appendices.

## erms and Definitions

<u>Table A Water (Table A Amounts)</u>

Each SWP contractor’s State Water Supply Contract (SWP Contract) contains a “Table A,” which lists the maximum amount of annual allocated water supply, or “Table A water,” an agency may request each year throughout the life of the contract. The Table A Amounts in each contractor’s SWP Contract ramped up over time, based on projections at the time the contracts were signed of future increases in population and water demand, until they reached a maximum Table A Amount. SCWA’s Table A reached its maximum allotment in 2015. Table A Amounts are used in determining each contractor’s proportionate share, or “allocation,” of the total SWP water supply DWR determines to be available each year. Table 1 below shows SCWA‘s active Participating Agencies’ allocation of 100% Table A. Vacaville and Fairfield numbers include 5,756 AF (50-50 split) Kern County Water Agency permanent Table A transfer purchased in 2001.

**A LE 1**
**SCWA A C A NG AGENC MA M M SW A LE A AMO N S AF**

| SCWA artici ating Agenc | Maximum a le A Amounts AF |
|---|---|
| City of Benicia | 17,200 |
| City of Fairfield | 14,678 |
| Suisun City | 1,300 |
| City of Vacaville | 8,978 |
| City of Vallejo | 5,600 |
| **O AL** | **47 756** |

The cities of Dixon and Rio Vista have a right to obtain a specified portion of SCWA Table A supply (1,500 AF each) in the future with a 5-year notice. However, they currently do not have a means to deliver the water into their service areas but may call upon their water with a 5-year notice. This allocation is currently being utilized by Benicia (1,125 AF), Fairfield (750 AF), and Vallejo (1,125 AF).

SWP Allocation

The amount of water that is allocated and delivered by the SWP to each contractor during a year under SWP contract is determined annually by DWR. Table A Amounts determine the maximum amount of water a contractor may request in any year from DWR. SWP allocations are based on CALSIM modeling runs that take into consideration SWP storage in Oroville and San Luis reservoirs, “South of Delta” (SOD) Contractor demand, hydrology, operational requirements and regulatory constraints. The allocation is typically reported as a percentage of maximum Table A amounts and is finalized by May 1 of the current year.

North of Delta Allocation

As a result of the North of Delta Settlement (December 31, 2013), DWR issues a separate SWP annual allocation for SCWA, Napa, and Yuba City (“the North of Delta (NOD) Contractors”), defined as the NOD Allocation. The NOD Allocation cannot exceed the Annual Table A Amounts. The NOD Allocation amounts to an additional increment of annual allocation above the current SWP Allocation described above. The other SOD contractors receive the baseline SWP allocation.

The concept of the NOD is to not penalize the NBA for conveyance restriction exclusive to the SOD pumping plants. Currently, DWR’s D1461 CALSIM model run is used as a surrogate for determining the NOD Allocation. All regulatory requirements under D1641 are met before allocations are met, so all contractors share in the responsibility to meet those regulatory requirements. D1641 was what the SWP operated to prior to the new ESA regulations, the 2008 and 2009 Biological Opinions. The Old-Middle River restrictions (OMR) part of the ESA regulations greatly impact the SOD pumping plant, but do not impact NOD diversions. However, the NOD allocation does provide an equitable share of any additional Delta outflow and water quality requirements, such as Fall X2.. If Delta regulations change in the future, the NOD Allocation may be affected commensurately.

Analysis performed by DWR estimated that SCWA could receive an additional 11 TAF approximately 50% of the years compared to existing Table A deliveries.[1] The actual differential varies each year being less in drier years. Since the implementation of the NOD Allocation in 2014, SCWA has received an additional increment of: 0% (2014), 5% (2015), and 15% (2016 as of April 1).

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[1] California Department of Water Resources State Water Project Analysis Office, *Initial Study/Proposed Negative Declaration State Water Project Supply Allocation Settlement Agreement*. Prepared by AECOM. July 2013.

Carryover Water

Carryover is unused Table A water “stored” in SWP reservoirs, when storage capacity is available, for use in the following years. SCWA Carryover is accounted for in San Luis Reservoir and may be partially or completely lost when San Luis “spills” meaning that carryover is displaced by higher priority new State Water Project water pumped into storage. The amount of Table A that can be converted and added to storage at the end of each year as new Carryover is governed by Article 56 of the SWP Contract. The amount of new Carryover allowed each year by Article 56 ranges from 25% to 50%, with interpolation in between, depending on the SWP Allocation for that year. There is no limit to the amount of accumulated carryover that can be stored.

Advanced Table A (ATA)

Another component of the North of Delta Settlement (December 31, 2013), Advanced Table A (ATA), is supplemental SWP water that can be used to make up shortfalls of the NOD Allocation in a given year under specific conditions. The annual NOD Allocation plus Advanced Table A requested cannot exceed SCWA contract amount of 47,756 acre-feet per year. ATA is limited to a maximum of 15,000 acre feet per year and a cumulative balance of 60,000 acre feet. ATA is only accessible when the SWP Allocation is greater than 20% and all available SCWA Table A and Carryover is used. Computer simulations show that a 20% or lower allocation would occur only once in the 82 years of record. In these years, the cumulative ATA limit is temporarily increased by 16,800 acre feet (or the current Advanced Table A balance, whichever is lessor) for use in future years. The ATA limit and cumulative balance resets when Oroville Reservoir spills and has limited pay-back provisions after 5 years. All active SCWA Participating Agencies have access to proportional allocation of ATA, at a minimum, when available.

Article 21 Water

Water identified in Article 21 of SWP Contract is additional unregulated water above the annual NOD Allocation available for diversion at the NBA when the Delta is in “excess” conditions. Solano, as a North Bay contractor, can access this water when DWR and the US Bureau of Reclamation mutually agree and declare that the Delta is in “excess” conditions which typically occur in winter and spring with storm runoff. The Delta is considered in “excess” conditions when the SWP and Central Valley Project are pumping the maximum amount allowed, all Delta standards are met, and there is still water available for export. “Balanced” conditions in the Delta occur when the SWP and CVP are releasing stored water into the Delta to meet their obligations and there is no extra water available in the system.

Settlement Water

Settlement Water (SW) is additional non-project water provided by a settlement agreement (executed May 19, 2003) among DWR, SCWA, and the cities of Fairfield, Vacaville, and Benicia. The agreement provides for delivery of up to 31,620 AFY of SW to SCWA for delivery through the NBA to the three cities to help meet their current and future municipal and industrial water needs. SW is not available when the Standard Water Right Term 91 is in effect. The Settlement expires December 31, 2035 with the option to renew. [2]

Standard Water Right Term 91 (Term 91)

Term 91 is declared by the State Water Resources Control Board when it is determined that the SWP and CVP are releasing stored water into the Delta in excess of natural flow ("natural" flow is the flow that would have been present if the dams did not exist) to meet inDelta demands and Delta water standards.

## 2014 SW Water Su l Allocation

The extremely dry sequence from the beginning of January 2013 through the end of 2014 was one of the driest two-year periods in the historical record. Water year 2013 was a year with two hydrologic extremes.[3] October through December 2012 was one of the wettest fall periods on record, but was followed by the driest consecutive 12 months on record. Accordingly, the 2013 State Water Project (SWP) supply allocation was a low 35% of SWP Table A Amounts. The 2013 hydrology ended up being even drier than DWR's conservative hydrologic forecast, so the SWP began 2014 with reservoir storage lower than targeted levels and less stored water available for 2014 supplies. Compounding this low storage situation, 2014 also was an extremely dry year, with runoff for water year 2014 the fourth driest on record. Due to extraordinarily dry conditions in 2013 and 2014, the 2014 SWP water supply allocation was a historically low 5% of Table A Amounts. The dry hydrologic conditions that led to the low 2014 SWP water supply allocation were extremely unusual, and to date have not been included in the SWP delivery estimates presented in DWR's 2015 Delivery Capability Report.[4] It is anticipated that the hydrologic record used in the DWR model will be extended to include the period through 2014 during the next update of the model, which is expected to be completed prior to issuance of the next update to the biennial SWP Delivery Capability Report. For the reasons stated above, the SCWA UWMP uses a conservative assumption that a 5% allocation of SWP Table A Amounts represents the "worst case" scenario.

[2] California Department of Water Resources (DWR). 2014. *Management of the California State Water Project: Bulletin 132-14*. <http://www.water.ca.gov/swpao/bulletin_home.cfm>

[3] A water year begins in October and runs through September. For example, water year 2013 is October 2012 through September 2013.

[4] SWP delivery estimates from DWR's 2015 SWP Delivery Capability Report are from computer model studies which use 82 years of historical hydrologic inflows from 1922 through 2003.

## SCWA SW elia ilit

For long term planning purposes, the Early Long Term (ELT) scenario of the DWR SWP CalSim model found in Appendix C of the DCR (excerpted and attached) was agreed upon by the SWP Contractors as the most appropriate scenario to use to estimate future supply availability. Therefore, future SWP supply availability presented in Table 2 is based on the ELT study included in the 2015 DCR.

**A LE 2**
**SW SCWA A LE A S L EL A L AF [a]**

| DW SW a le A Su l | of a le A Amount [c] | 2015 | 2020 | 2025 | 2030 | 2035-2050 |
|---|---|---|---|---|---|---|
| **Average Water Year[(d)]** | 73% | 34,869 | 34,869 | 34,869 | 34,869 | 34,869 |
| North of Delta Allocation[(e)] | +10% | 3,487 | 3,487 | 3,487 | 3,487 | 3,487 |
| **Single Dry Year[(f)]** | 22% | 10,351 | 10,351 | 10,351 | 10,351 | 10,351 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |
| **Multiple-Dry Year[(g)]** | 24% | 11,542 | 11,542 | 11,542 | 11,542 | 11,542 |
| North of Delta Allocation [(e)] | +3% | 346 | 346 | 346 | 346 | 346 |
| **2014 Table A Supply[(h)]** | 5% | 2,388 | 2,388 | 2,388 | 2,388 | 2,388 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its *"2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Supply as a percentage of SCWA's Table A Amount of 47,756 AF (DWR Bulletin 132-15, Appendix B, Data and Computations Used to Determine 2016 Water Charges, page B-36, Table B-4).
(d) Based on average deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

SCWA has subsequent long term water service contracts for SWP water supply deliveries with Participating Agencies. The SWP Table A Supply Reliability values in Table 2 can be applied directly to SCWA supply reliability and need to be adjusted to reflect individual SCWA Participating Agencies contract terms with SCWA. The following tables show the SCWA

Participating Agency SWP allocations based on Table 2 and Participating Agency maximum SCWA contract allocations in Table 1:

**A LE 3a**
**SW SCWA A C A NG AGENC S L EL A L AF [a]**
**C OF EN C A**

| DW SW a le A Su l | of a le A Amount [c] | 2015 | 2020 | 2025 | 2030 | 2035-2050 |
|---|---|---|---|---|---|---|
| **Average Water Year[(d)]** | 73% | 12,559 | 12,559 | 12,559 | 12,559 | 12,559 |
| North of Delta Allocation [(e)] | +10% | 1,256 | 1,256 | 1,256 | 1,256 | 1,256 |
| **Single Dry Year[(f)]** | 22% | 3,728 | 3,728 | 3,728 | 3,728 | 3,728 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |
| **Multiple-Dry Year[(g)]** | 24% | 4,157 | 4,157 | 4,157 | 4,157 | 4,157 |
| North of Delta Allocation [(e)] | +3% | 125 | 125 | 125 | 125 | 125 |
| **2014 Table A Supply[(h)]** | 5% | 860 | 860 | 860 | 860 | 860 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Benicia's SCWA Table A contract amount for SWP supply of 17,200 AF, not including Advanced Table A or Settlement Water.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

In addition to SWP supplies, the City of Benicia has access to 10,500 AFY of Settlement Water delivered through the North Bay Aqueduct when available.

A LE 3
SW SCWA A C A NG AGENC S L EL A L AF [a]
C OF FA F ELD

| DW SW a le A Su l | of a le A Amount [c] | 2015 | 2020 | 2025 | 2030 | 2035-2050 |
|---|---|---|---|---|---|---|
| **Average Water Year[(d)]** | 73% | 10,717 | 10,717 | 10,717 | 10,717 | 10,717 |
| North of Delta Allocation [(e)] | +10% | 1,072 | 1,072 | 1,072 | 1,072 | 1,072 |
| **Single Dry Year[(f)]** | 22% | 3,181 | 3,181 | 3,181 | 3,181 | 3,181 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |
| **Multiple-Dry Year[(g)]** | 24% | 3,547 | 3,547 | 3,547 | 3,547 | 3,547 |
| North of Delta Allocation [(e)] | +3% | 106 | 106 | 106 | 106 | 106 |
| **2014 Table A Supply[(h)]** | 5% | 734 | 734 | 734 | 734 | 734 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |

Notes:

(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).

(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.

(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.

(d) Supply as a percentage of City of Fairfield's SCWA contract amount for SWP supply of 14,678 AF, not including Advanced Table A or Settlement Water.

(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.

(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).

(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.

(h) Based on the worst-case actual SWP allocation of 2014.

(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

In addition to SWP supplies, the City of Fairfield has access to 11,800 AFY of Settlement Water Settlement Water, delivered through the North Bay Aqueduct when available.

**A LE 3c**
**SW SCWA AC C A NG AGENC S L EL A L AF [a]**
**C OF S S N C**

| DW SW a le A Su l | of a le A Amount [c] | 2015 | 2020 | 2025 | 2030 | 2035-2050 |
|---|---|---|---|---|---|---|
| **Average Water Year[(d)]** | 73% | 949 | 949 | 949 | 949 | 949 |
| North of Delta Allocation [(e)] | +10% | 95 | 95 | 95 | 95 | 95 |
| **Single Dry Year[(f)]** | 22% | 282 | 282 | 282 | 282 | 282 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |
| **Multiple-Dry Year[(g)]** | 24% | 314 | 314 | 314 | 314 | 314 |
| North of Delta Allocation [(e)] | +3% | 9 | 9 | 9 | 9 | 9 |
| **2014 Table A Supply[(h)]** | 5% | 65 | 65 | 65 | 65 | 65 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |

Notes:

(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).

(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.

(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.

(d) Supply as a percentage of City of Suisun City's SCWA contract amount for SWP supply of 1,300 AF.

(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.

(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).

(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.

(h) Based on the worst-case actual SWP allocation of 2014.

(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

**A LE 3d**
**SW SCWA A C A NG AGENC S L EL A L AF [a]**
**C OF VACAV LLE**

| DW SW a le A Su l | of a le A Amount [c] | 2015 | 2020 | 2025 | 2030 | 2035-2050 |
|---|---|---|---|---|---|---|
| **Average Water Year[(d)]** | 73% | 6,555 | 6,555 | 6,555 | 6,555 | 6,555 |
| North of Delta Allocation [(e)] | +10% | 656 | 656 | 656 | 656 | 656 |
| **Single Dry Year[(f)]** | 22% | 1,946 | 1,946 | 1,946 | 1,946 | 1,946 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |
| **Multiple-Dry Year[(g)]** | 24% | 2,170 | 2,170 | 2,170 | 2,170 | 2,170 |
| North of Delta Allocation [(e)] | +3% | 65 | 65 | 65 | 65 | 65 |
| **2014 Table A Supply[(h)]** | 5% | 449 | 449 | 449 | 449 | 449 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Vacaville's SCWA contract amount for SWP supply of 8,978 AF, not including Advanced Table A or Settlement Water.
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

In addition to SWP supplies, the City of Vacaville has access to 9,320 AFY of Settlement Water delivered through the North Bay Aqueduct when available.

**A LE 3e**
**SW SCWA A C A NG AGENC S L EL A L AF [a]**
**C OF VALLE O**

| DW SW a le A Su l | of a le A Amount [c] | 2015 | 2020 | 2025 | 2030 | 2035-2050 |
|---|---|---|---|---|---|---|
| **Average Water Year[(d)]** | 73% | 4,089 | 4,089 | 4,089 | 4,089 | 4,089 |
| North of Delta Allocation [(e)] | +10% | 409 | 409 | 409 | 409 | 409 |
| **Single Dry Year[(f)]** | 22% | 1,214 | 1,214 | 1,214 | 1,214 | 1,214 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |
| **Multiple-Dry Year[(g)]** | 24% | 1,353 | 1,353 | 1,353 | 1,353 | 1,353 |
| North of Delta Allocation [(e)] | +3% | 41 | 41 | 41 | 41 | 41 |
| **2014 Table A Supply[(h)]** | 5% | 280 | 280 | 280 | 280 | 280 |
| North of Delta Allocation [(e)] | +0% | 0 | 0 | 0 | 0 | 0 |

Notes:
(a) Supplies to SCWA are based on DWR analyses presented in its "*2015 State Water Project Delivery Capability Report" (2015 DCR),* assuming existing SWP facilities and current regulatory and operational constraints (except as otherwise indicated in Note (h)).
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average SWP deliveries over a repeat of the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of City of Vallejo's SCWA contract amount for SWP supply of 5,600 AF
(e) North of Delta Allocation as an additional percentage of SCWA's Table A Allocation, estimated based on actual amounts received since the implementation of the North of Delta Settlement in 2014. Because of the limited historical data, this estimate is preliminary and will be adjusted for subsequent UWMP updates as additional data becomes available.
(f) Based on a repeat of the worst case historic single dry year of 1977 (from 2015 DCR).
(g) Supplies shown are annual averages over four consecutive dry years, based on a repeat of the historic four-year dry period of 1931-1934.
(h) Based on the worst-case actual SWP allocation of 2014.
(i) Advanced Table A allocations are not quantified in this table but this supplemental SWP water can be used to make up shortfalls in the North of Delta Allocation in a given year under specific conditions.

## Solano Project

The Solano Project is a federal facility owned by the Bureau of Reclamation (USBR) that stores water in Lake Berryessa for delivery to agriculture and municipal and industrial users throughout the Solano County. SCWA has a long-term master water supply agreement with USBR that currently expires in 2025 but is renewable. The Solano Project first delivered water in 1959. The major facilities are:

- Monticello Dam, which captures water from Putah Creek in Lake Berryessa;
- Putah Diversion Dam, which diverts water out of Lower Putah Creek just downstream of Monticello Dam; and

- Putah South Canal, which delivers water to local agencies. The Putah South Canal is 33 miles long, concrete lined and has a maximum capacity of 956 cubic feet per second.

The annual firm yield of the Solano Project is 207,350 AFY. Solano Project water is designated for Agricultural (AG) and Municipal and Industrial (M&I) uses allocated to Participating Agencies as follows in Table 4:

**TABLE 4**
**SCWA PARTICIPATING AGENCY MAXIMUM SOLANO PROJECT ALLOCATION (AF)**

| Participating Agency | Maximum Allocation (AFY) | Use |
|---|---|---|
| City of Fairfield | 9,200 | M&I |
| City of Suisun | 1,600 | M&I |
| City of Vacaville | 5,750 | M&I |
| City of Vallejo | 14,600 | M&I |
| Solano Irrigation District | 141,000 | AG+M&I |
| Maine Prairie Water District | 15,000 | AG |
| University of California- Davis | 4,000 | AG |
| California State Prison- Solano | 1,200 | AG+M&I |
| SCWA | 15,000 | Operating Loss |
| **TOTAL** | **207,350** | |

Reliability estimates for the Solano Project were last updated for the 2010 UWMP and were developed based on historic hydrology from 1906-2003, Lake Berryessa inflows, and the Sacramento Valley Index (SVI) for hydrologic year types (wet, above normal, below normal, dry, critically dry). The SVI was further categorized into Average Year (above normal, below normal), Single Dry Year, and Multi-Dry Year. As noted in the August 10, 2010 SCWA memorandum presenting the 2010 SCWA water supply reliability, the update of the Solano Project reliability analysis from 2005 to 2009 resulted in minimal change. This is assumed to remain true for 2015; therefore, it is recommended that the 2015 Solano Project Reliability estimates use the Solano Project reliability estimates from the 2010 SCWA UWMP. The recommended 2015 Solano Project Reliability estimates are presented in Table 5 below.

**TABLE 5**
**SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[a] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[b] | 205,825 | 205,825 | 205,825 | 205,825 | 205,825 |
| % of Contract Amount[b] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[c] | 204,051 | 204,051 | 204,051 | 204,051 | 204,051 |
| % of Contract Amount[c] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[d] | 184,887 | 184,887 | 184,887 | 184,887 | 184,887 |
| % of Contract Amount[d] | 89% | 89% | 89% | 89% | 89% |

Notes:
(a) SCWA's Total Participating Agency Contract Amounts equal 207,350 AF and includes 15,000 AF of canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.

SCWA has subsequent long term water service contracts for Solano Project water supply deliveries with Participating Agencies. Similar to the SWP Table A Supply Reliability, Solano Project Reliability shown in Table 5 are for SCWA and need to be adjusted to reflect individual Participating Agencies contract terms. The following tables show the SCWA Participating Agency Solano Project allocations based on Table 5 and Participating Agency maximum contract allocations in Table 4:

**TABLE a**
**CITY OF FAIRFIEL SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[(a)] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[(b)] | 9,132 | 9,132 | 9,132 | 9,132 | 9,132 |
| % of Contract Amount[(b)] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[(c)] | 9,054 | 9,054 | 9,054 | 9,054 | 9,054 |
| % of Contract Amount[(c)] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[(d)] | 8,203 | 8,203 | 8,203 | 8,203 | 8,203 |
| % of Contract Amount[(d)] | 89% | 89% | 89% | 89% | 89% |

(a) City of Fairfield's Solano Project Contract Amount is 9,200 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) The City of Fairfield may have additional water supply agreements in place with other agencies. See the City of Fairfield's most recently adopted UWMP for descriptions of their water supply portfolio.

**TABLE**
**CITY OF SUISUN CITY SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[(a)] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[(b)] | 1,588 | 1,588 | 1,588 | 1,588 | 1,588 |
| % of Contract Amount[(b)] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[(c)] | 1,575 | 1,575 | 1,575 | 1,575 | 1,575 |
| % of Contract Amount[(c)] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[(d)] | 1,427 | 1,427 | 1,427 | 1,427 | 1,427 |
| % of Contract Amount[(d)] | 89% | 89% | 89% | 89% | 89% |

(a) City of Suisun City's Solano Project Contract Amount is 1,600 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) Suisun City may have additional water supply agreements in place with other agencies. See the Suisun Solano Water Authority's most recently adopted UWMP for descriptions of their water supply portfolio.

**TABLE c**
**CITY OF ACA ILLE SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[a] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[b] | 5,708 | 5,708 | 5,708 | 5,708 | 5,708 |
| % of Contract Amount[b] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[c] | 5,659 | 5,659 | 5,659 | 5,659 | 5,659 |
| % of Contract Amount[c] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[d] | 5,127 | 5,127 | 5,127 | 5,127 | 5,127 |
| % of Contract Amount[d] | 89% | 89% | 89% | 89% | 89% |

(a) City of Vacaville's Solano Project Contract Amount is 5,750 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) City of Vacaville may have additional water supply agreements in place with other agencies. See the City of Vacaville's most recently adopted UWMP for descriptions of their water supply portfolio.

**TABLE**
**CITY OF ALLEJO SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[a] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[b] | 14,493 | 14,493 | 14,493 | 14,493 | 14,493 |
| % of Contract Amount[b] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[c] | 14,368 | 14,368 | 14,368 | 14,368 | 14,368 |
| % of Contract Amount[c] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[d] | 13,018 | 13,018 | 13,018 | 13,018 | 13,018 |
| % of Contract Amount[d] | 89% | 89% | 89% | 89% | 89% |

(a) City of Vallejo's Solano Project Contract Amount is 14,600 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) City of Vallejo may have additional water supply agreements in place with other agencies. See the City of Vallejo's most recently adopted UWMP for descriptions of their water supply portfolio.

**TABLE e**
**CALIFORNIA STATE PRISON SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[a] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[b] | 1,191 | 1,191 | 1,191 | 1,191 | 1,191 |
| % of Contract Amount[b] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[c] | 1,181 | 1,181 | 1,181 | 1,181 | 1,181 |
| % of Contract Amount[c] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[d] | 1,070 | 1,070 | 1,070 | 1,070 | 1,070 |
| % of Contract Amount[d] | 89% | 89% | 89% | 89% | 89% |

(a) California State Prison's Solano Project Contract Amount is 1,200 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.

**TABLE**
**MAINE PRAIRIE WATER ISTRICT SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[a] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[b] | 14,890 | 14,890 | 14,890 | 14,890 | 14,890 |
| % of Contract Amount[b] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[c] | 14,761 | 14,761 | 14,761 | 14,761 | 14,761 |
| % of Contract Amount[c] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[d] | 13,375 | 13,375 | 13,375 | 13,375 | 13,375 |
| % of Contract Amount[d] | 89% | 89% | 89% | 89% | 89% |

(a) Maine Prairie Water District's Solano Project Contract Amount is 15,000 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) Maine Prairie Water District may have additional water supply agreements in place with other agencies, which are not shown in this table.

**TABLE g**
**SOLANO IRRIGATION ISTRICT SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[(a)] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[(b)] | 139,963 | 139,963 | 139,963 | 139,963 | 139,963 |
| % of Contract Amount[(b)] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[(c)] | 138,757 | 138,757 | 138,757 | 138,757 | 138,757 |
| % of Contract Amount[(c)] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[(d)] | 125,725 | 125,725 | 125,725 | 125,725 | 125,725 |
| % of Contract Amount[(d)] | 89% | 89% | 89% | 89% | 89% |

(a) Solano Irrigation District's Solano Project Contract Amount is 141,000 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.
(e) Solano Irrigation District may have additional water supply agreements in place with other agencies, which are not shown in this table.

**TABLE**
**UNI ERSITY OF CALIFORNIA, A IS SOLANO PROJECT SUPPLY RELIABILITY (AF)**

| Solano Pro ect Supply[(a)] | 20 5 | 2020 | 2025 | 2030 | 2035 2050 |
|---|---|---|---|---|---|
| Average Water Year[(b)] | 3,971 | 3,971 | 3,971 | 3,971 | 3,971 |
| % of Contract Amount[(b)] | 99% | 99% | 99% | 99% | 99% |
| Single Dry Year[(c)] | 3,936 | 3,936 | 3,936 | 3,936 | 3,936 |
| % of Contract Amount[(c)] | 98% | 98% | 98% | 98% | 98% |
| Multi-Dry Year[(d)] | 3,567 | 3,567 | 3,567 | 3,567 | 3,567 |
| % of Contract Amount[(d)] | 89% | 89% | 89% | 89% | 89% |

(a) University of California, Davis's Solano Project Contract Amount is 4,000 AF, not including canal losses.
(b) Based on average percent allocation (including canal losses) during Average Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(c) Based on the average percent allocation (including canal losses) during Single Dry Years over the study's historic hydrologic period of 1906 through 2007, rounded to the nearest whole percent.
(d) Supplies shown are average percent allocation (including canal losses) over four consecutive dry years, based on a repeat of the historic four-year dry period with low inflow to Lake Berryessa of 1990-1994, rounded to the nearest whole percent.

Enclosure(s) (2)

1. 2015 SWP Delivery Capability Report Excerpt of Appendix C
2. Memorandum, Subject: UWMP Reliability Data (Revised for SWP-prior memo is dated 6/10/10 - Solano Project data unchanged)

Table C.29. Solano County WA: 2015 DCR ELT

| SWP Table A Deliveries for 2015 Study | | | | | Probability Curve | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Delivery w/o Article 56 Carryover (TAF) | Article 56 Carryover (TAF) | Total Table A Delivery (TAF) | Percent of Maximum Table A | Year | Total Table A Delivery (TAF) | Exceedence Frequency (%) | Percent of Maximum Table A |
| 1922 | 48 | 0 | 48 | 100% | 1938 | 48 | 0% | 100% |
| 1923 | 40 | 0 | 40 | 84% | 1938 | 48 | 1% | 100% |
| 1924 | 12 | 0 | 12 | 25% | 1938 | 48 | 2% | 100% |
| 1925 | 23 | 0 | 23 | 48% | 1938 | 48 | 4% | 100% |
| 1926 | 23 | 0 | 23 | 48% | 1938 | 48 | 5% | 100% |
| 1927 | 44 | 0 | 44 | 93% | 1938 | 48 | 6% | 100% |
| 1928 | 44 | 0 | 44 | 93% | 1922 | 48 | 7% | 100% |
| 1929 | 12 | 0 | 12 | 25% | 1922 | 48 | 9% | 100% |
| 1930 | 23 | 0 | 23 | 48% | 1922 | 48 | 10% | 100% |
| 1931 | 12 | 0 | 12 | 25% | 1922 | 48 | 11% | 100% |
| 1932 | 12 | 0 | 12 | 25% | 1963 | 48 | 12% | 100% |
| 1933 | 12 | 0 | 12 | 25% | 1963 | 48 | 14% | 100% |
| 1934 | 10 | 0 | 10 | 22% | 1963 | 48 | 15% | 100% |
| 1935 | 23 | 0 | 23 | 48% | 1963 | 48 | 16% | 100% |
| 1936 | 40 | 0 | 40 | 84% | 1942 | 48 | 17% | 100% |
| 1937 | 23 | 0 | 23 | 48% | 1942 | 48 | 19% | 100% |
| 1938 | 48 | 0 | 48 | 100% | 1942 | 48 | 20% | 100% |
| 1939 | 40 | 0 | 40 | 84% | 1942 | 48 | 21% | 100% |
| 1940 | 44 | 0 | 44 | 93% | 1942 | 48 | 22% | 100% |
| 1941 | 48 | 0 | 48 | 100% | 1942 | 48 | 23% | 100% |
| 1942 | 48 | 0 | 48 | 100% | 1942 | 48 | 25% | 100% |
| 1943 | 48 | 0 | 48 | 100% | 1942 | 48 | 26% | 100% |
| 1944 | 23 | 0 | 23 | 48% | 1942 | 48 | 27% | 100% |
| 1945 | 40 | 0 | 40 | 84% | 1942 | 48 | 28% | 100% |
| 1946 | 44 | 0 | 44 | 93% | 1942 | 48 | 30% | 100% |
| 1947 | 23 | 0 | 23 | 48% | 1942 | 48 | 31% | 100% |
| 1948 | 40 | 0 | 40 | 84% | 1927 | 44 | 32% | 93% |
| 1949 | 23 | 0 | 23 | 48% | 1927 | 44 | 33% | 93% |
| 1950 | 23 | 0 | 23 | 48% | 1927 | 44 | 35% | 93% |
| 1951 | 44 | 0 | 44 | 93% | 1927 | 44 | 36% | 93% |
| 1952 | 48 | 0 | 48 | 100% | 1927 | 44 | 37% | 93% |
| 1953 | 48 | 0 | 48 | 100% | 1927 | 44 | 38% | 93% |
| 1954 | 44 | 0 | 44 | 93% | 1927 | 44 | 40% | 93% |
| 1955 | 23 | 0 | 23 | 48% | 1927 | 44 | 41% | 93% |
| 1956 | 48 | 0 | 48 | 100% | 1927 | 44 | 42% | 93% |
| 1957 | 44 | 0 | 44 | 93% | 1940 | 44 | 43% | 93% |
| 1958 | 48 | 0 | 48 | 100% | 1940 | 44 | 44% | 93% |
| 1959 | 40 | 0 | 40 | 84% | 1940 | 44 | 46% | 93% |
| 1960 | 23 | 0 | 23 | 48% | 2003 | 43 | 47% | 91% |
| 1961 | 23 | 0 | 23 | 48% | 1923 | 40 | 48% | 84% |
| 1962 | 40 | 0 | 40 | 84% | 1923 | 40 | 49% | 84% |
| 1963 | 48 | 0 | 48 | 100% | 1923 | 40 | 51% | 84% |
| 1964 | 23 | 0 | 23 | 48% | 1923 | 40 | 52% | 84% |

| SWP Table A Deliveries for 2015 Study | | | | | | Probability Curve | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Delivery w/o Article 56 Carryover (TAF) | Article 56 Carryover (TAF) | Total Table A Delivery (TAF) | Percent of Maximum Table A | | Year | Total Table A Delivery (TAF) | Exceedence Frequency (%) | Percent of Maximum Table A |
| 1965 | 48 | 0 | 48 | 100% | | 1923 | 40 | 53% | 84% |
| 1966 | 40 | 0 | 40 | 84% | | 1923 | 40 | 54% | 84% |
| 1967 | 48 | 0 | 48 | 100% | | 1923 | 40 | 56% | 84% |
| 1968 | 40 | 0 | 40 | 84% | | 1923 | 40 | 57% | 84% |
| 1969 | 48 | 0 | 48 | 100% | | 1923 | 40 | 58% | 84% |
| 1970 | 48 | 0 | 48 | 100% | | 1923 | 40 | 59% | 84% |
| 1971 | 48 | 0 | 48 | 100% | | 1923 | 40 | 60% | 84% |
| 1972 | 40 | 0 | 40 | 84% | | 1947 | 23 | 62% | 48% |
| 1973 | 44 | 0 | 44 | 93% | | 2002 | 23 | 63% | 48% |
| 1974 | 48 | 0 | 48 | 100% | | 1925 | 23 | 64% | 48% |
| 1975 | 48 | 0 | 48 | 100% | | 1925 | 23 | 65% | 48% |
| 1976 | 23 | 0 | 23 | 48% | | 1925 | 23 | 67% | 48% |
| 1977 | 12 | 0 | 12 | 25% | | 1925 | 23 | 68% | 48% |
| 1978 | 44 | 0 | 44 | 93% | | 1925 | 23 | 69% | 48% |
| 1979 | 23 | 0 | 23 | 48% | | 1925 | 23 | 70% | 48% |
| 1980 | 44 | 0 | 44 | 93% | | 1925 | 23 | 72% | 48% |
| 1981 | 23 | 0 | 23 | 48% | | 1925 | 23 | 73% | 48% |
| 1982 | 48 | 0 | 48 | 100% | | 1925 | 23 | 74% | 48% |
| 1983 | 48 | 0 | 48 | 100% | | 1925 | 23 | 75% | 48% |
| 1984 | 48 | 0 | 48 | 100% | | 1925 | 23 | 77% | 48% |
| 1985 | 40 | 0 | 40 | 84% | | 1925 | 23 | 78% | 48% |
| 1986 | 48 | 0 | 48 | 100% | | 1925 | 23 | 79% | 48% |
| 1987 | 23 | 0 | 23 | 48% | | 1925 | 23 | 80% | 48% |
| 1988 | 12 | 0 | 12 | 25% | | 1925 | 23 | 81% | 48% |
| 1989 | 23 | 0 | 23 | 48% | | 1925 | 23 | 83% | 48% |
| 1990 | 12 | 0 | 12 | 25% | | 1937 | 23 | 84% | 48% |
| 1991 | 12 | 0 | 12 | 25% | | 1937 | 23 | 85% | 48% |
| 1992 | 12 | 0 | 12 | 25% | | 1924 | 12 | 86% | 25% |
| 1993 | 44 | 0 | 44 | 93% | | 1924 | 12 | 88% | 25% |
| 1994 | 12 | 0 | 12 | 25% | | 1924 | 12 | 89% | 25% |
| 1995 | 48 | 0 | 48 | 100% | | 1931 | 12 | 90% | 25% |
| 1996 | 48 | 0 | 48 | 100% | | 1931 | 12 | 91% | 25% |
| 1997 | 48 | 0 | 48 | 100% | | 1931 | 12 | 93% | 25% |
| 1998 | 48 | 0 | 48 | 100% | | 1931 | 12 | 94% | 25% |
| 1999 | 48 | 0 | 48 | 100% | | 1931 | 12 | 95% | 25% |
| 2000 | 44 | 0 | 44 | 93% | | 1931 | 12 | 96% | 25% |
| 2001 | 23 | 0 | 23 | 48% | | 1931 | 12 | 98% | 25% |
| 2002 | 23 | 0 | 23 | 48% | | 1931 | 12 | 99% | 25% |
| 2003 | 43 | 0 | 43 | 91% | | 1934 | 10 | 100% | 22% |
| **Average** | **35** | **0** | **35** | **73%** | | | **35** | | **73%** |
| **Maximum** | **48** | **0** | **48** | **100%** | | | **48** | | **100%** |
| **Minimum** | **10** | **0** | **10** | **22%** | | | **10** | | **22%** |

## Appendix C Solano Project Reliability

**Ultimate** level of development-of Lake Berryessa watershed @ 30,000 AF/yr - 2009 Study

Lake Berryessa Index

| Value | Year Type |
|---|---|
| W | Wet |
| N | Below Normal |
| N | Above Normal |
| D | Dry |
| D | Critically Dry |

| Year | Index Value | % Full Alloc | % Full Alloc for Normal Year (N) | % Full Alloc for Single Dry Year (D) * | % Full Alloc for Multiple Dry Years (3 or more Dry years) |
|---|---|---|---|---|---|
| 1906 | W | 100% | | | |
| 1907 | W | 100% | | | |
| 1908 | D | 100% | | 100% | |
| 1909 | W | 100% | | | |
| 1910 | N | 100% | 100% | | |
| 1911 | W | 100% | | | |
| 1912 | D | 100% | | 100% | |
| 1913 | D | 100% | | | |
| 1914 | W | 100% | | | |
| 1915 | W | 100% | | | |
| 1916 | W | 100% | | | |
| 1917 | N | 100% | 100% | | |
| 1918 | D | 100% | | 100% | |
| 1919 | N | 100% | 100% | | |
| 1920 | D | 100% | | 100% | |
| 1921 | N | 100% | 100% | | |
| 1922 | N | 100% | 100% | | |
| 1923 | N | 100% | 100% | | |
| 1924 | D | 95% | | 95% | |
| 1925 | N | 95% | 95% | | |
| 1926 | N | 95% | 95% | | |
| 1927 | W | 95% | | | |
| 1928 | N | 100% | 100% | | |
| 1929 | D | 95% | | 95% | |
| 1930 | N | 95% | 95% | | |
| 1931 | D | 100% | | 100% | 100% |
| 1932 | D | 100% | | | 100% |
| 1933 | D | 45% | | | 45% |
| 1934 | D | 45% | | | 45% |
| 1935 | N | 100% | 100% | | |
| 1936 | N | 100% | 100% | | |
| 1937 | N | 100% | 100% | | |
| 1938 | W | 100% | | | |
| 1939 | D | 95% | | 95% | |

| | | | | | |
|---|---|---|---|---|---|
| 1940 | W | 100% | | | |
| 1941 | W | 100% | | | |
| 1942 | W | 100% | | | |
| 1943 | N | 100% | 100% | | |
| 1944 | D | 100% | | 100% | |
| 1945 | N | 100% | 100% | | |
| 1946 | N | 100% | 100% | | |
| 1947 | D | 100% | | 100% | 100% |
| 1948 | D | 95% | | | 95% |
| 1949 | D | 95% | | | 95% |
| 1950 | D | 95% | | | 95% |
| 1951 | N | 95% | 95% | | |
| 1952 | W | 100% | | | |
| 1953 | N | 100% | 100% | | |
| 1954 | N | 100% | 100% | | |
| 1955 | D | 95% | | 95% | |
| 1956 | W | 100% | | | |
| 1957 | D | 100% | | 100% | |
| 1958 | W | 100% | | | |
| 1959 | D | 100% | | 100% | |
| 1960 | N | 100% | 100% | | |
| 1961 | D | 100% | | 100% | |
| 1962 | N | 100% | 100% | | |
| 1963 | W | 100% | | | |
| 1964 | D | 100% | | 100% | |
| 1965 | W | 100% | | | |
| 1966 | N | 100% | 100% | | |
| 1967 | W | 100% | | | |
| 1968 | N | 100% | 100% | | |
| 1969 | W | 100% | | | |
| 1970 | W | 100% | | | |
| 1971 | N | 100% | 100% | | |
| 1972 | D | 100% | | 100% | |
| 1973 | W | 100% | | | |
| 1974 | W | 100% | | | |
| 1975 | N | 100% | 100% | | |
| 1976 | D | 100% | | 100% | |
| 1977 | D | 100% | | | |
| 1978 | W | 100% | | | |
| 1979 | N | 100% | 100% | | |
| 1980 | W | 100% | | | |
| 1981 | D | 100% | | 100% | |
| 1982 | W | 100% | | | |
| 1983 | W | 100% | | | |
| 1984 | N | 100% | 100% | | |
| 1985 | D | 100% | | 100% | |
| 1986 | W | 100% | | | |
| 1987 | D | 100% | | 100% | 100% |
| 1988 | D | 100% | | | 100% |
| 1989 | D | 100% | | | 100% |
| 1990 | D | 95% | | | 95% |
| 1991 | N | 95% | 95% | | |

| | | | | | |
|---|---|---|---|---|---|
| 1992 | D | 90% | | 90% | |
| 1993 | W | 95% | | | |
| 1994 | D | 95% | | 95% | |
| 1995 | W | 100% | | | |
| 1996 | W | 100% | | | |
| 1997 | W | 100% | | | |
| 1998 | W | 100% | | | |
| 1999 | N | 100% | 100% | | |
| 2000 | N | 100% | 100% | | |
| 2001 | D | 100% | | 100% | |
| 2002 | N | 100% | 100% | | |
| 2003 | N | 100% | 100% | | |
| 2003 | W | 100% | | | |
| 2004 | N | 100% | 100% | | |
| 2005 | N | 100% | 100% | | |
| 2006 | W | 100% | | | |
| 2007 | | 100% | | | |
| | Average | 98% | 99% | 98% | 89% |

*Includes first year of consecutive dry years

# APPENDIX G

# SUPPLEMENTAL ANALYSIS FOR SETTLEMENT WATER
# IN SUPPORT OF THE CITY OF VACAVILLE
# SB610 WATER SUPPLY ASSESSMENT

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# Supplemental Analysis in Support of the City of Vacaville SB 610 Water Supply Assessment

PREPARED FOR: David Tompkins, P.E., Assistant Director of Public Works

PREPARED BY: Mark Leu, P.E.
Greg Eldridge, P.E.

COPIES: Richard Hunn

DATE: January 9, 2004

## I. Introduction

The purpose of this technical memorandum (TM) is to provide supporting analysis to the City's SB 610 Water Supply Assessment Report for Lagoon Valley, Southtown and Rice McMurtry. Specifically, this analysis addresses the expected reliability of the water to be provided to the City in accordance with the *Settlement Agreement Among the Department of Water Resources of the State of California, Solano County Water Agency, and Cities of Fairfield, Vacaville, and Benicia for Purposes of Water Supply*, dated May 19, 2003. This water is referred to as "Settlement Water". The analysis is consistent with the *Agreement for Conveying Settlement Water Through the North Bay Aqueduct by the Department of Water Resources to the Solano County Water Agency for the Cities of Fairfield, Vacaville, and Benicia*, dated May 19, 2003.

Settlement Water is one of several sources of water that the City of Vacaville requires to meet current and future water demands. Table 1 lists all sources of Vacaville's water supply.

TABLE 1
City of Vacaville Water Sources

| Water Supply Source | Water Supply Volume (acre-feet) |
|---|---|
| Solano Project – Vacaville Entitlement | 5,750 |
| Solano Project – SID Agreement | 10,050 |
| State Water Project – Vacaville Entitlement | 6,100 |
| State Water Project – KCWA Agreement | 2,878 |
| DWR – Settlement Water | 9,320 |
| Groundwater | 8,000 |
| Recycled Water | 880 |
| Total | 42,978 |

reference: City of Vacaville, 2003.

# II. Analysis Methods

To determine the expected reliability of Vacaville's Settlement Water, a supply simulation model was utilized. The reliability of Settlement Water was analyzed on an annual basis in the context of all water supply sources utilized by the City. The model used in this supplemental analysis, SOLANO_SIM, was developed for the Draft Environmental Impact Report (DEIR) for the *Cities of Fairfield, Vacaville, and Benicia Water Rights Appropriations Project* (2001). The Settlement Agreement with DWR was a result of negotiations to protests by DWR and the State Water Contractors to the area of origin water right applications filed by the Cities of Vacaville, Fairfield and Benicia.

One input to SOLANO_SIM were the State Water Project (SWP) deliveries to the NBA as simulated by CALSIM II. The CALSIM II model run was the same run used for the *State Water Project Delivery Reliability Report* (DWR 2002). The model run was published May 17, 2002 using a full SWP contract amount in every year (Model Run BST_2020D09D_FULLENTITLEMENT_5_1 [2021b Study]). The use of the recent CALSIM II results was an update to the SOLANO_SIM model runs used for the DEIR.

## Simulation Modeling for Vacaville Water Supplies

SOLANO_SIM model simulation runs were performed using a monthly timestep. The model simulated the State Water Project North Bay Aqueduct (NBA), the primary conveyance facility needed to serve the cities of Vacaville, Fairfield, and Benicia.

Barker Slough Pumping Plant (BSPP) lifts water from Barker Slough into the NBA with a stated physical capacity of 175 cubic feet per second. The NBA was constructed to serve areas in Solano and Napa County. SWP Table A contract deliveries to Solano County Water Agency (purveyor to Vacaville, Fairfield, and Benicia), the Cities of Vallejo and Napa, and other contractors are simulated in SOLANO_SIM. Settlement Water is then assumed delivered through any remaining BSPP and NBA simulated conveyance capacities. The simulation model, additionally, performs tests for excess NBA capacity at 1) the Solano County Regional Water Treatment Plant, and, 2) at the turnouts to Vallejo and Napa.

SOLANO_SIM utilizes monthly distributions of the aforementioned supplies. The deliveries of water through the NBA to the three cities are premised on the 73 year output (1922 – 1994 simulation) from CALSIM II simulation results provided by DWR. Excess capacity is computed monthly to determine the physical potential to deliver settlement water to each city. Excess capacity is shared in proportion to the maximum settlement amount (Vacaville/Fairfield/Benicia - 9.32/11.80/10.50).

There is a provision in SOLANO_SIM to share and bank any unused NBA capacity between Fairfield and Vacaville as well. Any capacity not used by one of the cities can be used by the other. A running account is kept and balanced out each year.

Simulations of delivery of settlement water considers all senior users of the NBA. Deliveries are not simulated if physical capacity of the NBA has been reached in any month.

Another water delivery provision critical to evaluating the overall water supply reliability for the City of Vacaville involves the contract provision limiting SWP deliveries in a single month to 11% of the SWP contract total [12. Delivery Schedules (a) Limit on Peak Deliveries of Water]. The simulation model is consistent with this contract provision.

Standard Term 91 applies to months when the Delta is in balanced conditions and the SWP and the Central Valley Project are releasing water to meet minimum Delta water quality standards. Since Settlement Water is not available to Vacaville when Term 91 is in effect, SOLANO_SIM restricts use of that source during those months.

### Analysis Model Run

The simulation of Vacaville water supply under ultimate foreseeable demand was modeled for the hydrology record 1922-1994. The SB 610 analysis is required for demands projected every five years through 2025, but this supplemental analysis utilizes a single model run using DWRs 2020 hydrology with Vacaville's ultimate foreseeable demand to determine how sources of water are utilized under the worst-case scenario.

To determine the expected reliability of Settlement Water for an entire year, it must be analyzed in conjunction with other sources utilized by the City of Vacaville. The model has a predefined priority system to determine which supplies are used within operational and physical constraints. Settlement Water is taken to meet Vacaville demands after Solano Project Water (for the DE plant), a minimum amount of groundwater pumping, SWP Vacaville contract amount, the SWP KCWA agreement water.

## III. Expected Reliability of Settlement Water

The expected reliability of Settlement Water is analyzed on an annual basis within the context of all other water supplies. The simulation modeling objective is to meet the monthly Vacaville water demand with supplies other than Settlement Water in months when Term 91 is in effect. By utilizing Settlement Water in months when Term 91 is not in effect, the full annual contract amount of Settlement Water is used on an annual basis.

Table 2 shows the annual results from the SOLANO_SIM run for Vacaville's ultimate foreseeable demand, which is the buildout level of demand as analyzed in the Water Rights Appropriations Project DEIR. The tables illustrate how the Vacaville demand was nearly met in every year by using a varied mix of supplies. The model simulation results show Vacaville using the full contracted amount of Settlement Water, 9,320 acre-feet, in every year indicating the firm reliability of this supply.

TABLE 2
SOLANO_SIM Model Results on Annual Basis for Vacaville Under Ultimate Foreseeable Demand Conditions
*1922-1994 Hydrology, (thousand acre-feet)*

| Calendar Year | Demand | Ground-water | Recycled Water | Settlement Water | SWP | Solano Project | KCWA | Total Supply |
|---|---|---|---|---|---|---|---|---|
| **1922** | 40.6 | 7.55 | 0.88 | 9.32 | 6.09 | 15.60 | 1.16 | 40.60 |
| **1923** | 40.6 | 7.93 | 0.88 | 9.32 | 5.29 | 15.60 | 1.55 | 40.57 |
| **1924** | 40.6 | 9.27 | 0.88 | 9.32 | 1.53 | 15.60 | 1.44 | 38.04 |
| **1925** | 40.6 | 8.99 | 0.88 | 9.32 | 2.21 | 15.60 | 1.44 | 38.44 |
| **1926** | 40.6 | 7.93 | 0.88 | 9.32 | 4.50 | 15.60 | 1.75 | 39.99 |
| **1927** | 40.6 | 7.51 | 0.88 | 9.32 | 6.05 | 15.60 | 1.23 | 40.60 |

TABLE 2
SOLANO_SIM Model Results on Annual Basis for Vacaville Under Ultimate Foreseeable Demand Conditions
*1922-1994 Hydrology, (thousand acre-feet)*

| Calendar Year | Demand | Ground-water | Recycled Water | Settlement Water | SWP | Solano Project | KCWA | Total Supply |
|---|---|---|---|---|---|---|---|---|
| **1928** | 40.6 | 7.90 | 0.88 | 9.32 | 4.92 | 15.60 | 1.98 | 40.60 |
| **1929** | 40.6 | 9.27 | 0.88 | 9.32 | 1.69 | 15.60 | 1.44 | 38.20 |
| **1930** | 40.6 | 8.15 | 0.88 | 9.32 | 4.30 | 15.60 | 1.67 | 39.92 |
| **1931** | 40.6 | 9.27 | 0.88 | 9.32 | 1.69 | 15.60 | 1.44 | 38.21 |
| **1932** | 40.6 | 8.54 | 0.88 | 9.32 | 2.74 | 15.60 | 1.44 | 38.52 |
| **1933** | 40.6 | 9.03 | 0.88 | 9.32 | 3.07 | 15.60 | 1.44 | 39.34 |
| **1934** | 40.6 | 9.27 | 0.88 | 9.32 | 2.40 | 15.60 | 1.44 | 38.91 |
| **1935** | 40.6 | 7.38 | 0.88 | 9.32 | 5.99 | 15.60 | 1.43 | 40.60 |
| **1936** | 40.6 | 7.25 | 0.88 | 9.32 | 5.99 | 15.60 | 1.57 | 40.60 |
| **1937** | 40.6 | 7.64 | 0.88 | 9.32 | 5.32 | 15.60 | 1.84 | 40.60 |
| **1938** | 40.6 | 7.64 | 0.88 | 9.32 | 6.08 | 15.60 | 1.09 | 40.60 |
| **1939** | 40.6 | 7.86 | 0.88 | 9.32 | 5.06 | 15.60 | 1.88 | 40.60 |
| **1940** | 40.6 | 7.45 | 0.88 | 9.32 | 6.07 | 15.60 | 1.28 | 40.60 |
| **1941** | 40.6 | 7.64 | 0.88 | 9.32 | 6.10 | 15.60 | 1.06 | 40.60 |
| **1942** | 40.6 | 7.49 | 0.88 | 9.32 | 6.10 | 15.60 | 1.21 | 40.60 |
| **1943** | 40.6 | 7.81 | 0.88 | 9.32 | 5.21 | 15.60 | 1.77 | 40.60 |
| **1944** | 40.6 | 7.70 | 0.88 | 9.32 | 5.40 | 15.60 | 1.70 | 40.60 |
| **1945** | 40.6 | 7.48 | 0.88 | 9.32 | 5.71 | 15.60 | 1.61 | 40.60 |
| **1946** | 40.6 | 7.57 | 0.88 | 9.32 | 5.59 | 15.60 | 1.63 | 40.60 |
| **1947** | 40.6 | 8.14 | 0.88 | 9.32 | 4.34 | 15.60 | 1.63 | 39.91 |
| **1948** | 40.6 | 7.93 | 0.88 | 9.32 | 4.90 | 15.60 | 1.88 | 40.51 |
| **1949** | 40.6 | 8.28 | 0.88 | 9.32 | 4.40 | 15.60 | 1.44 | 39.92 |
| **1950** | 40.6 | 7.93 | 0.88 | 9.32 | 4.83 | 15.60 | 1.97 | 40.53 |
| **1951** | 40.6 | 7.52 | 0.88 | 9.32 | 5.85 | 15.60 | 1.43 | 40.60 |
| **1952** | 40.6 | 7.57 | 0.88 | 9.32 | 6.09 | 15.60 | 1.13 | 40.60 |
| **1953** | 40.6 | 7.49 | 0.88 | 9.32 | 5.79 | 15.60 | 1.52 | 40.60 |
| **1954** | 40.6 | 7.42 | 0.88 | 9.32 | 5.87 | 15.60 | 1.51 | 40.60 |
| **1955** | 40.6 | 8.48 | 0.88 | 9.32 | 2.71 | 15.60 | 1.50 | 38.49 |
| **1956** | 40.6 | 7.65 | 0.88 | 9.32 | 6.00 | 15.60 | 1.16 | 40.60 |
| **1957** | 40.6 | 7.93 | 0.88 | 9.32 | 4.61 | 15.60 | 1.99 | 40.34 |
| **1958** | 40.6 | 7.66 | 0.88 | 9.32 | 6.05 | 15.60 | 1.09 | 40.60 |

TABLE 2
SOLANO_SIM Model Results on Annual Basis for Vacaville Under Ultimate Foreseeable Demand Conditions
*1922-1994 Hydrology, (thousand acre-feet)*

| Calendar Year | Demand | Ground-water | Recycled Water | Settlement Water | SWP | Solano Project | KCWA | Total Supply |
|---|---|---|---|---|---|---|---|---|
| **1959** | 40.6 | 7.84 | 0.88 | 9.32 | 5.09 | 15.60 | 1.87 | 40.60 |
| **1960** | 40.6 | 8.37 | 0.88 | 9.32 | 3.44 | 15.60 | 1.67 | 39.28 |
| **1961** | 40.6 | 7.96 | 0.88 | 9.32 | 4.58 | 15.60 | 1.58 | 39.93 |
| **1962** | 40.6 | 7.72 | 0.88 | 9.32 | 5.30 | 15.60 | 1.78 | 40.60 |
| **1963** | 40.6 | 7.49 | 0.88 | 9.32 | 6.08 | 15.60 | 1.23 | 40.60 |
| **1964** | 40.6 | 7.93 | 0.88 | 9.32 | 4.52 | 15.60 | 2.00 | 40.26 |
| **1965** | 40.6 | 7.93 | 0.88 | 9.32 | 4.70 | 15.60 | 1.92 | 40.35 |
| **1966** | 40.6 | 7.68 | 0.88 | 9.32 | 5.60 | 15.60 | 1.52 | 40.60 |
| **1967** | 40.6 | 7.58 | 0.88 | 9.32 | 6.09 | 15.60 | 1.13 | 40.60 |
| **1968** | 40.6 | 7.82 | 0.88 | 9.32 | 5.21 | 15.60 | 1.78 | 40.60 |
| **1969** | 40.6 | 7.66 | 0.88 | 9.32 | 6.07 | 15.60 | 1.06 | 40.60 |
| **1970** | 40.6 | 7.55 | 0.88 | 9.32 | 5.75 | 15.60 | 1.51 | 40.60 |
| **1971** | 40.6 | 7.58 | 0.88 | 9.32 | 6.00 | 15.60 | 1.21 | 40.60 |
| **1972** | 40.6 | 7.97 | 0.88 | 9.32 | 3.95 | 15.60 | 2.17 | 39.89 |
| **1973** | 40.6 | 7.78 | 0.88 | 9.32 | 5.41 | 15.60 | 1.61 | 40.60 |
| **1974** | 40.6 | 7.59 | 0.88 | 9.32 | 5.99 | 15.60 | 1.21 | 40.60 |
| **1975** | 40.6 | 7.50 | 0.88 | 9.32 | 6.01 | 15.60 | 1.29 | 40.60 |
| **1976** | 40.6 | 8.66 | 0.88 | 9.32 | 4.00 | 15.60 | 2.04 | 40.51 |
| **1977** | 40.6 | 9.27 | 0.88 | 9.32 | 1.26 | 15.60 | 1.44 | 37.77 |
| **1978** | 40.6 | 7.82 | 0.88 | 9.32 | 5.87 | 15.60 | 1.12 | 40.60 |
| **1979** | 40.6 | 7.82 | 0.88 | 9.32 | 5.20 | 15.60 | 1.78 | 40.60 |
| **1980** | 40.6 | 7.93 | 0.88 | 9.32 | 4.96 | 15.60 | 1.88 | 40.58 |
| **1981** | 40.6 | 7.93 | 0.88 | 9.32 | 4.89 | 15.60 | 1.86 | 40.48 |
| **1982** | 40.6 | 7.74 | 0.88 | 9.32 | 5.81 | 15.60 | 1.25 | 40.60 |
| **1983** | 40.6 | 7.74 | 0.88 | 9.32 | 5.83 | 15.60 | 1.23 | 40.60 |
| **1984** | 40.6 | 7.64 | 0.88 | 9.32 | 5.75 | 15.60 | 1.41 | 40.60 |
| **1985** | 40.6 | 7.93 | 0.88 | 9.32 | 4.88 | 15.60 | 1.94 | 40.56 |
| **1986** | 40.6 | 7.93 | 0.88 | 9.32 | 4.58 | 15.60 | 2.02 | 40.33 |
| **1987** | 40.6 | 8.32 | 0.88 | 9.32 | 4.15 | 15.60 | 1.63 | 39.90 |
| **1988** | 40.6 | 9.27 | 0.88 | 9.32 | 1.45 | 15.60 | 1.44 | 37.96 |
| **1989** | 40.6 | 7.93 | 0.88 | 9.32 | 4.73 | 15.60 | 1.88 | 40.34 |

TABLE 2
SOLANO_SIM Model Results on Annual Basis for Vacaville Under Ultimate Foreseeable Demand Conditions
*1922-1994 Hydrology, (thousand acre-feet)*

| Calendar Year | Demand | Ground-water | Recycled Water | Settlement Water | SWP | Solano Project | KCWA | Total Supply |
|---|---|---|---|---|---|---|---|---|
| **1990** | 40.6 | 9.27 | 0.88 | 9.32 | 1.75 | 15.60 | 1.44 | 38.26 |
| **1991** | 40.6 | 9.27 | 0.88 | 9.32 | 1.49 | 15.60 | 1.44 | 38.00 |
| **1992** | 40.6 | 9.27 | 0.88 | 9.32 | 1.69 | 15.60 | 1.44 | 38.20 |
| **1993** | 40.6 | 7.86 | 0.88 | 9.32 | 5.71 | 15.60 | 1.23 | 40.60 |
| **1994** | 40.6 | 7.86 | 0.88 | 9.32 | 5.20 | 15.60 | 1.74 | 40.60 |
| | | | | | | | | |
| **Min** | 40.6 | 7.25 | 0.88 | 9.32 | 1.26 | 15.60 | 1.06 | 37.77 |
| **Average** | 40.6 | 8.01 | 0.88 | 9.32 | 4.73 | 15.60 | 1.54 | 40.09 |
| **Max** | 40.6 | 9.27 | 0.88 | 9.32 | 6.10 | 15.60 | 2.17 | 40.60 |

While the model results in Table 2 illustrate how the full contract amount of Settlement Water is available and used each year under ultimate foreseeable demand, for any given month in a year this supply may not be available. Under the terms of the Settlement Agreement, DWR is not required to make Settlement Water available to SCWA and Vacaville when Term 91 condition is in effect. This condition typically occurs during the summer and or fall months of the year and ranges from one to five months in duration.

During these months, the simulation model indicates that Vacaville will rely on other sources of water including the SWP water. The model simulates delivery of this water while adhering to all allocated capacity rules on the NBA and SWP contract peak monthly flow constraints. Table 3 has examples of a single normal year, a single dry year, and multiple dry years averaged together. The table shows how the mix of water supply changes from year to year. Generally, months without Settlement Water delivery are months with Term 91 in effect. The water year type designations were determined by Vacaville Utilities and based on the DWR Sacramento Valley Water Year Index. The City's year type classifications are presented in Appendix C of the *SB 610 Water Supply Assessment Report for Lagoon Valley, Southtown, and Rice McMurtry* (Vacaville 2003).

The simulation modeling indicates that the Settlement Water is 100% reliable in terms of annual quantity available. However, the timing of deliveries of the Settlement Water is dependant on whether or not Term 91 is in effect. As illustrated in Table 3 below, when Term 91 is in effect, the monthly demand will be met with the other sources until Settlement Water can be used.

TABLE 3
SOLANO_SIM Model Results on Monthly Basis for Vacaville Under Ultimate Foreseeable Demand Conditions [a]
*1922-1994 Hydrology, (thousand acre-feet)*

| **1948 Single Normal Year, SWP Allocation 81%** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** | **Total** | **Jan-Dec** |
| **Groundwater** | 0.18 | 0.39 | 0.89 | 0.18 | 0.18 | 0.18 | 0.18 | 0.86 | 1.62 | 1.65 | 1.65 | 0.18 | 8.14 | 7.93 |
| **Recycled** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.88 | 0.88 |
| **Settlement Water** | 1.33 | 0.00 | 0.00 | 1.63 | 1.51 | 1.97 | 1.35 | 1.25 | 0.00 | 0.00 | 0.00 | 1.14 | 10.19 | 9.32 |
| **SWP** | 0.47 | 0.39 | 0.22 | 0.13 | 0.15 | 0.25 | 0.44 | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 | 4.74 | 4.90 |
| **Solano Project** | 1.66 | 0.02 | 0.00 | 0.00 | 0.00 | 0.41 | 1.50 | 1.86 | 2.31 | 1.91 | 1.88 | 2.73 | 14.27 | 15.60 |
| **KCWA** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.03 | 0.84 | 0.00 | 1.88 | 1.88 |
| **Total Supply** | 3.64 | 0.79 | 1.11 | 1.94 | 1.84 | 2.81 | 3.47 | 4.69 | 4.65 | 5.31 | 5.09 | 4.76 | 40.11 | 40.51 |
| **1976 Single Dry Year, SWP Allocation 65%** | | | | | | | | | | | | | | |
| | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** | **Total** | **Jan-Dec** |
| **Groundwater** | 0.18 | 0.18 | 0.46 | 0.18 | 0.18 | 0.18 | 0.18 | 0.86 | 1.62 | 1.65 | 1.65 | 0.18 | 7.50 | 8.66 |
| **Recycled** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.88 | 0.88 |
| **Settlement Water** | 0.75 | 1.11 | 0.21 | 1.57 | 1.50 | 1.91 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.03 | 8.09 | 9.32 |
| **SWP** | 0.66 | 0.54 | 0.30 | 0.18 | 0.12 | 0.20 | 0.35 | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 | 4.52 | 4.00 |
| **Solano Project** | 1.85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.41 | 2.80 | 3.05 | 2.42 | 1.90 | 1.95 | 2.54 | 16.92 | 15.60 |
| **KCWA** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.16 | 0.89 | 0.00 | 2.04 | 2.04 |
| **Total Supply** | 3.44 | 1.83 | 0.97 | 1.93 | 1.80 | 2.70 | 3.34 | 4.53 | 4.65 | 5.31 | 5.09 | 4.36 | 39.95 | 40.51 |
| **1987-1990 Multiple Dry Years, Averaged, Average SWP Allocation 51%** | | | | | | | | | | | | | | |
| | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** | **Total** | **Jan-Dec** |
| **Groundwater** | 0.40 | 0.39 | 0.89 | 0.18 | 0.18 | 0.18 | 0.18 | 0.86 | 1.62 | 1.65 | 1.65 | 0.18 | 8.37 | 8.70 |
| **Recycled** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.88 | 0.88 |
| **Settlement Water** | 1.34 | 0.22 | 0.00 | 1.62 | 1.54 | 2.15 | 0.71 | 0.00 | 0.00 | 0.00 | 0.00 | 1.44 | 9.02 | 9.32 |
| **SWP** | 0.41 | 0.34 | 0.19 | 0.11 | 0.09 | 0.15 | 0.27 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 3.20 | 3.02 |
| **Solano Project** | 1.31 | 0.27 | 0.00 | 0.00 | 0.00 | 0.26 | 2.23 | 3.16 | 2.52 | 1.86 | 2.63 | 2.05 | 16.30 | 15.60 |
| **KCWA** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.29 | 0.30 | 0.00 | 1.60 | 1.60 |
| **Total Supply** | 3.46 | 1.22 | 1.08 | 1.92 | 1.81 | 2.73 | 3.39 | 4.53 | 4.65 | 5.31 | 5.09 | 4.18 | 39.37 | 39.12 |

[a] The model SOLANO_SIM operates on a standard Water Year, October-September. The annual results for the DWR Year, January-December, are also shown to be consistent with annual SWP and Settlement Water contract amounts.

# IV. References

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# APPENDIX H

# ORDINANCE No. 1891 ADOPTING STATE MODEL WATER EFFICIENT LANDSCAPE ORDINANCE DIVISION 14.27

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