



2009 - 2010

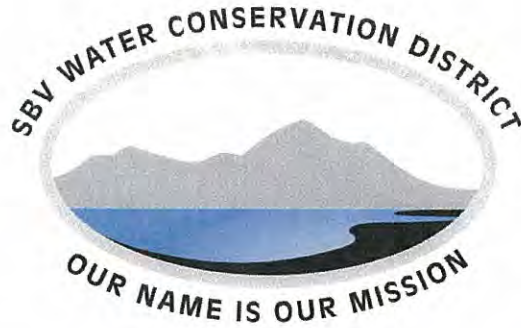
# ENGINEERING INVESTIGATION



**GROUNDWATER CONDITIONS IN THE**

**SAN BERNARDINO VALLEY WATER CONSERVATION DISTRICT**





**ENGINEERING INVESTIGATION  
Bunker Hill Basin  
2009-2010  
For the period  
2008-2009**

**March 2010  
Addendum May 2010**

**Groundwater Conditions in the  
San Bernardino Valley Water Conservation District**

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## Acknowledgments

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The staff of San Bernardino Valley Water Conservation District would like to recognize the efforts of those agencies that contributed data for this Engineering Investigation. The cooperation received from the following agencies is gratefully acknowledged.

- **City of Colton**
- **East Valley Water District**
- **City of Riverside**
- **West Valley Water District**
- **United States Geological Survey, Santee, CA Office**
- **San Bernardino Valley Municipal Water District**
- **San Bernardino County Department of Flood Control**
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## ***Introduction***

The 2009-2010 Engineering Investigation is being presented with a number of changes compared to previous EI Reports. Thanks to the new part-time staff addition of Lisa Pierce, who holds advanced degrees in environmental and water resources planning and is a certified GIS instructor, much more effort was given towards researching, documenting, and graphically displaying surface and groundwater activities within the Bunker Hill Basin and specifically within the Water Conservation District's boundaries during the last water year. Ms. Pierce was able to share and help coordinate acquisition of water elevation and production data with various other San Bernardino Valley entities. Many thanks goes to the following agencies: San Bernardino Valley Municipal Water District (Valley), Steve Mains' Watermaster Support Services, the Cities of San Bernardino, Colton, Riverside, Rialto & Redlands, and East Valley Water District, West Valley Water District and Fontana Water Company as well as other entities who document well water withdrawal and water level events throughout the year. Her coordinating efforts in not only providing the more verified information, but also assisting others in formatting changes that will make applications of GIS production data, metadata, and graphical data more assessable for all future accounting and reports, promotes more interagency cooperation, and will improve increased information sharing in future years.

Other changes the reader will see in this report are:

This introduction has been inserted to provide a general overview of the report and the formatting and informational changes that have been made.

Figures and Tables have been inserted within the appropriate text areas, instead of being contained in separate tabbed sections.

More explanations have been provided to expound on the conclusions drawn from the various sections of the report, to assist the reader in understanding the engineering terminology and better synthesis of the outcomes.





Maps have been drawn with more visible color contrasts and with increased color differentiation to increase visibility and understanding. And the maps contents have been modified to graphically describe the associated texts.

The term "Water Year" used in the previous EI reports to describe the annual time frames of the study periods, includes the time frame of July 1 to the following June 30. This coincides with the biannual invoicing periods but does not coincide with the Fall-to-Fall time frames used for calculating the well water level changes and the resulting basin volume changes. The initial EI Report presented in March, 2010 attempted to coincide all descriptions of "Water Years" as October 1 to September 30 of the following year, which coincide with the Water Year used in reporting the District's water spreading activities and results of the Daily Flow Report. It also offers a more current picture of the District's activities. This addendum report reverts to the prevailing time frame convention by describing the Water Year as July 1 through to the following June 30. This has been used and accepted by the local water community as well as is being one interpretation of at least two alternatives reporting time periods per the State Water Code.

Previous Engineering Investigation report versions presented the engineering analyses of the water supply issues of the Bunker Hill Basin and the Water Conservation District, but the resulting conclusions dealing with the financial results of the previous year's water related activities were never included. This year's edition contains a section dealing with the financial picture of spreading water and the associated costs.



## **1.0 Executive Summary**

Article 1, Section 75560 of the California Water Code requires that a Water Conservation District that proposes to levy a groundwater charge "... shall annually cause to be made an engineering investigation and report upon groundwater conditions of the District." In accordance with these requirements, the San Bernardino Valley Water Conservation District (District) must make the following findings and determinations as they relate to the ground and surface water conditions of the Bunker Hill Basin and those areas within the District boundary. Refer to **Figure 1** for locations. (Page 11)

- Task 1.** Annual change in storage for the Bunker Hill Basin for the preceding water year (Fall 2008 to Fall 2009);
- Task 2.** Accumulated change in storage of the Bunker Hill Basin as of the last day of the preceding water year (June 30, 2009);
- Task 3.** Total groundwater production from the Bunker Hill Basin for the preceding water year (July 1, 2008 - June 30, 2009);
- Task 4.** Estimate of the annual change in the Bunker Hill Basin storage for the current water year (July 1, 2009 - June 30, 2010);
- Task 5.** Estimate of the annual change in the Bunker Hill Basin storage for the ensuing water year (July 1, 2010 – June 30, 2011);
- Task 6.** Average annual change in Bunker Hill Basin storage for the immediate past ten water years (1998 - 2009);
- Task 7.** Estimated amount of agricultural water and other than agricultural water to be withdrawn from the groundwater supplies of the District for the ensuing water year (July 1, 2010 - June 30, 2011);
- Task 8.** Estimated amount of water necessary for surface distribution for the ensuing water year for the Bunker Hill Basin and the District (July 1, 2010 - June 30, 2011); and
- Task 9.** The amount of water that is necessary for the replenishment of the groundwater supplies of the Bunker Hill Basin and the District for the ensuing water year (July 1, 2010 - June 30, 2011).

To make the findings and determinations listed above, District staff researched available hydro geologic, water well production and (static water) sounding records and



engineering data for the Bunker Hill Basin. These data were compiled and analyzed and a predictive relationship between precipitation, production, and change in basin storage was developed. This relationship, based on empirical data, enables the prediction of change in storage, given certain annual production and precipitation levels. In addition, annual and accumulated change in storage values were calculated based on historic water level changes throughout the Bunker Hill Basin.

Based on 20 measuring stations, precipitation throughout the contributing watershed was 92 percent of normal for the period October 1, 2008 to September 31, 2009. Based on the change in groundwater well water elevation data compiled for Fall 2008 and Fall 2009, the amount of groundwater stored in the Bunker Hill Basin decreased by 36,600 acre-feet.

The required findings for the 2010 Engineering Investigation are provided below. Each of the tasks is further explained in the main body of the report. Throughout this document a positive sign (+) denotes an increase in stored groundwater or groundwater level elevation while a negative sign (-) denotes a decrease in stored groundwater or lowering of groundwater level elevation.



**Summary of Findings for the 2009-2010 Engineering Investigation Report,  
Covering the Water Year of July 1, 2008 to June 30, 2009 (except as noted  
earlier).**

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**Task 1.** Annual change in storage for the Bunker Hill Basin for the preceding water year (Fall 2008 to Fall 2009 groundwater levels)

Change in storage between Fall 2008 and Fall 2009 (see Table 3)

**-35,600 acre-feet (decrease)**

**The amount of water stored in the Basin decreased on average by 35,600 acre-feet between 2008 and 2009.**

**Task 2.** Accumulated change in storage of the Bunker Hill Basin as of the last day of the preceding water year (2009)

Accumulated change in storage between July 1993 and June 2009<sup>1</sup>  
(see Table 4)

**-397,600 acre-feet (decrease)**

**The amount of potential water storage space in the summer of 2009 was 330,000 acre-feet less than in the summer of 1993. (See footnote 1 below.)**

**Task 3.** Total groundwater production from the Bunker Hill Basin for the preceding water year (July 1, 2008 – June 30, 2009) (see Table 5)

**188,951 acre-feet**

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<sup>1</sup> In the District's Engineering Investigation (EI) prior to 1993-94, the accumulated change in storage was based on the basin storage in 1984 as considered full. A concern arose regarding the flooding of basements due to high groundwater levels in the Pressure Zone of the Bunker Hill Basin. Therefore, in response to the City of San Bernardino's comments on accumulated change in storage, all EI's since that time are based on 1993 basin storage levels considered as full.



**Task 4.** Estimate of the annual change in the Bunker Hill Basin storage for the current water year (July 1, 2009 - June 30, 2010)

**-12,638 acre-feet (decrease)**

**The amount of water in the Basin is estimated to decrease by 12,638 acre-feet during the current water year.**

**Task 5.** Estimate of the annual change in the Bunker Hill Basin storage for the ensuing water year (July 1, 2009 - June 30, 2010)

**-12,638 acre-feet (decrease)**

**The amount of water in the Basin is estimated to decrease by 12,638 acre-feet during the ensuing water year.**

**Task 6.** Average annual change in Bunker Hill Basin storage for the immediate past 10 water years (1999 - 2009) shows a continual decrease, although less in magnitude than previous years:

**-33,051 acre-feet (decrease)**

Estimated amount of agricultural water and other than agricultural water to be withdrawn from the groundwater supplies of the District for the ensuing water year July 1, 2009 - June 30, 2010)





**Task 7.** Estimated amount of agricultural water (Agg Water) that will be withdrawn from the groundwater supplies within the District boundary for the ensuing water year (July 1, 2010 - June30, 2011)

**14,808 acre-feet**

Estimated amount of other than agricultural water (Non-Agg Water) that will be withdrawn from the groundwater supplies of the District for the ensuing water year (July 1, 2010 – June 30, 2011)

**107,179 acre-feet**

**Task 8.** Estimated amount of water necessary for surface distribution for the ensuing water year for the Bunker Hill Basin and the District (July 1, 2010 – June 30, 2011)

Estimated amount of water necessary for surface distribution for the ensuing water year (July 1, 2010 - June 30, 2011) for the Bunker Hill Basin (Table 8, 2009 Average was used)

**71,405 acre-feet**

Estimated amount of water necessary for surface distribution for the ensuing water year (July 1, 2010 - June 30, 2011) within the District boundary

**59,527 acre-feet**

**Task 9.** The amount of water necessary from all sources, including natural recharge, to maintain constant groundwater supplies in the Bunker Hill Basin for the ensuing water year (July 1, 2010 - June 30, 2011)

The amount of water necessary from all sources, including natural recharge, to maintain constant groundwater supplies in the Bunker Hill Basin for the ensuing water year (July 1, 2010 - June 30, 2011)



**181,082 acre-feet**

The amount of water necessary from all sources, including natural recharge, to maintain constant groundwater supplies within the District boundary for the ensuing water year (July 1, 2010 - June 30, 2011)

**128,306 acre-feet**

The amount of water necessary from all sources, including natural recharge, to bring the basin back to "full" in the ensuing water year (July 1, 2010 - June 30, 2011)

**591,320 acre-feet**

In addition to the above findings, Section 75505 of the California Water Code requires that a finding be made as to the amount of water necessary to be replaced in the intake areas of the groundwater basins within the District to prevent the landward movement of salt water into the fresh groundwater body, or to prevent subsidence of the land within the District. Because of its location and the elevations of its water table (lowest was at least 600-feet above mean sea level – MSL), the Bunker Hill Basin is not subject to salt-water intrusion and the current groundwater levels will not result in any significant land subsidence.

Section 75540 of the California Water Code requires that the District Board establish a zone or zones where a groundwater charge is to be implemented. The Code specifically states that a single zone may include the entire District and in May 1993 the Board established the entire District as one zone. This determination may be amended in the future, but lacking any evidence to the contrary, in the 2009-10 year the entire District will remain as a single zone in regard to any groundwater charges.



Section 75561 of the California Water Code further requires the Engineering Investigation to include a finding related to the amount of water the District is obligated by contract to purchase. At this time the District has no contractual obligation to purchase water for the replenishment of the groundwater supplies. The District did contract with Valley (Municipal Water District, a State Water Contractor), as a contributing valley water entity, to spread 2,000 acre-feet of DWR excess allocation water within the District's spreading basins, using District's money reserves for payment.

**Based on the results of the 2009 Engineering Investigation, the San Bernardino Valley Water Conservation District finds that:**

- Due to the imbalance between groundwater recharge and production since 1993, the Bunker Hill Basin's storage is 397,600 acre-feet below that which is considered full for purposes of this Investigation.
- During the ensuing water year (July 1, 2010 - June 30, 2011), the Bunker Hill Basin can be recharged, from all sources, with 591,320 acre-feet of water. This recharge quantity is needed to maintain the 1993 storage level that is considered full.
- The District should continue to take the necessary steps to enhance its capability to conduct recharge operations, which includes consideration of new, or maintenance and repair of existing, diversion facilities, canals, dikes, basins, roads, and other water recharge facilities. These improvements are required to ensure that the increasing demands on the Basin, especially during drought periods, can be met.



- The District has begun collaborative construction efforts with Valley to improve the capacities and delivery capabilities of the District's Upper Santa Ana River diverted water conveyance canals and spreading basins. Valley is the lead on the project. An initial portion of the overall project, the upgrade of the Cuttle Weir has already been completed. An investigation and design contract for the improvements is currently underway. The results of the improvements will be increased handling (up to 500 cfs) of Seven Oaks Dam (SOD) emergency water release and the increased capability to distribute the river water through a larger portion of the watershed basin.
- The District will be implementing new plans and goals as a result of its nearly completed Strategic Plan for the District's future.



## **2.0 Introduction**

### **2.1 Purpose and Scope**

The San Bernardino Valley Water Conservation District (District) was created by popular vote in 1931 for the purpose of managing the recharge activities that were previously conducted by the Water Conservation Association. The Water Conservation Association was incorporated in 1909 and had been diverting flows from the Santa Ana River for groundwater recharge since 1911. Currently the District has ownership, as well as easements and/or use of properties owned by the Bureau of Land Management (BLM), on a total of 3,735 acres within the Santa Ana River and Mill Creek Wash areas. The District boundary covers an area of approximately 50,000 acres, which represents about 60 percent of the Bunker Hill Basin. **Figure 1** displays the project area map for the Engineering Investigation. It includes the District boundary along with its location relative to the Interstate and State highways.

Article 1, Section 75560 of the California Water Code requires that a Water Conservation District that proposes to levy a groundwater charge "... shall annually cause to be made an engineering investigation and report upon groundwater conditions of the District." In accordance with these requirements, the San Bernardino Valley Water Conservation District (District) must make the following findings and determinations as they relate to the ground and surface water conditions of the Bunker Hill Basin and those areas within the District boundary.

- Task 1.** Annual change in storage for the Bunker Hill Basin for the preceding water year (Fall 2008 to Fall 2009);
- Task 2.** Accumulated change in storage of the Bunker Hill Basin as of the last day of the preceding water year (June 30, 2009);
- Task 3.** Total groundwater production from the Bunker Hill Basin for the preceding water year (July 1, 2008 – June 30, 2009);





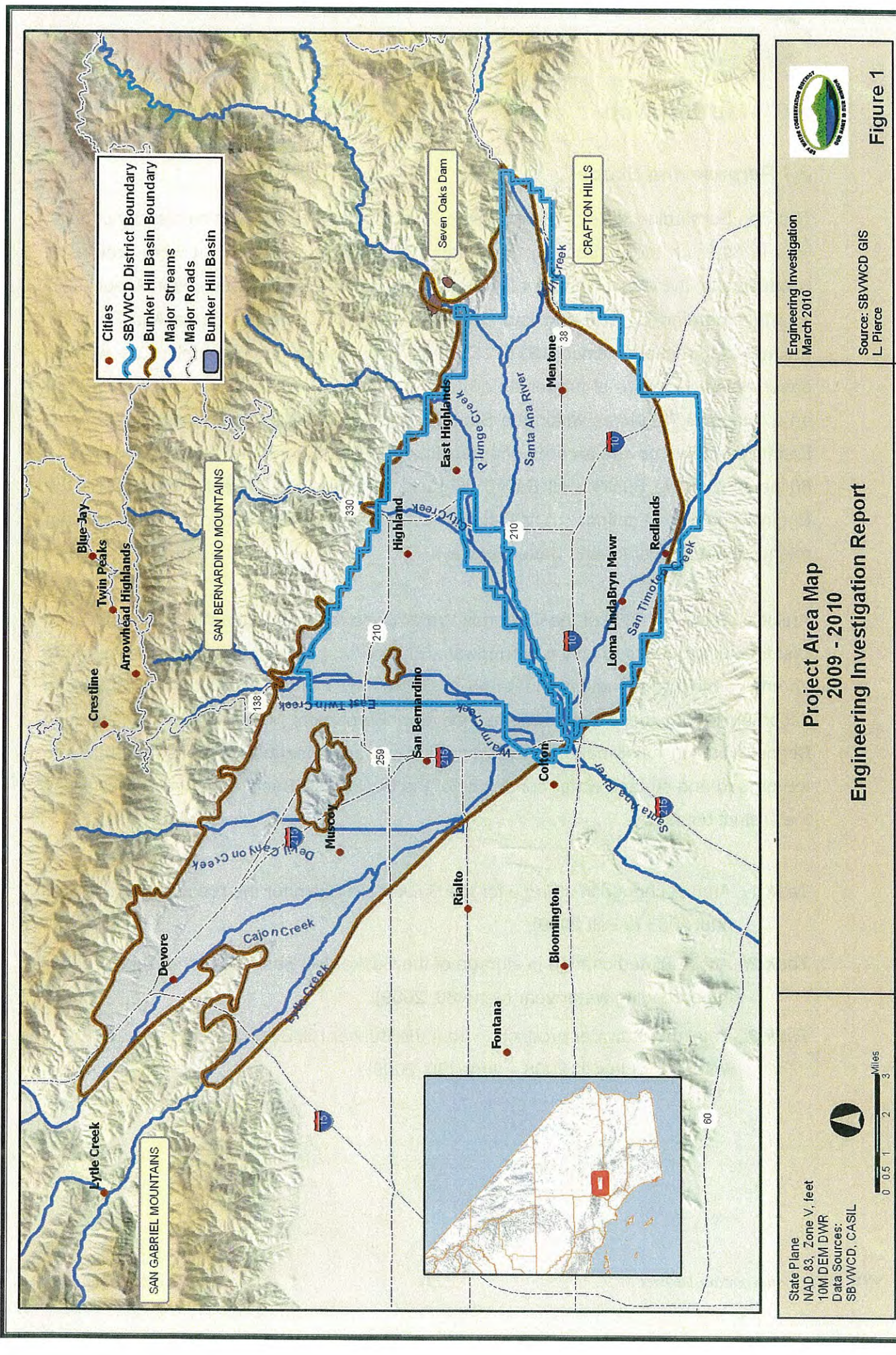
Figure 1

Engineering Investigation  
March 2010

Source: SBVWCD GIS  
L. Pierce

# Project Area Map 2009 - 2010 Engineering Investigation Report

State Plane  
NAD 83, Zone V, feet  
10M DEM, DWR  
Data Sources:  
SBVWCD, CASIL







- Task 4.** Estimate of the annual change in the Bunker Hill Basin storage for the current water year (July 1, 2009 - June 30, 2010);
- Task 5.** Estimate of the annual change in the Bunker Hill Basin storage for the ensuing water year (July 1, 2010 – June 30, 2011);
- Task 6.** Average annual change in Bunker Hill Basin storage for the immediate past ten water years (1999 - 2009);
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To make the findings and determinations listed above, District staff researched available hydrogeologic, precipitation, water well production and (static water) sounding records, and engineering data for the Bunker Hill Basin and surrounding areas. These data were compiled and analyzed and a predictive relationship between precipitation, production, and change in basin storage was adapted from similar relationships developed by Geoscience Support Services in the preparation of previous Engineering Investigations. This relationship, based on empirical data, enables the prediction of change in storage, given certain annual production and precipitation levels. In addition, annual and accumulated change in storage was calculated based on historic water level changes throughout the Bunker Hill Basin.



## ***2.2 Location, Topography and Climate***

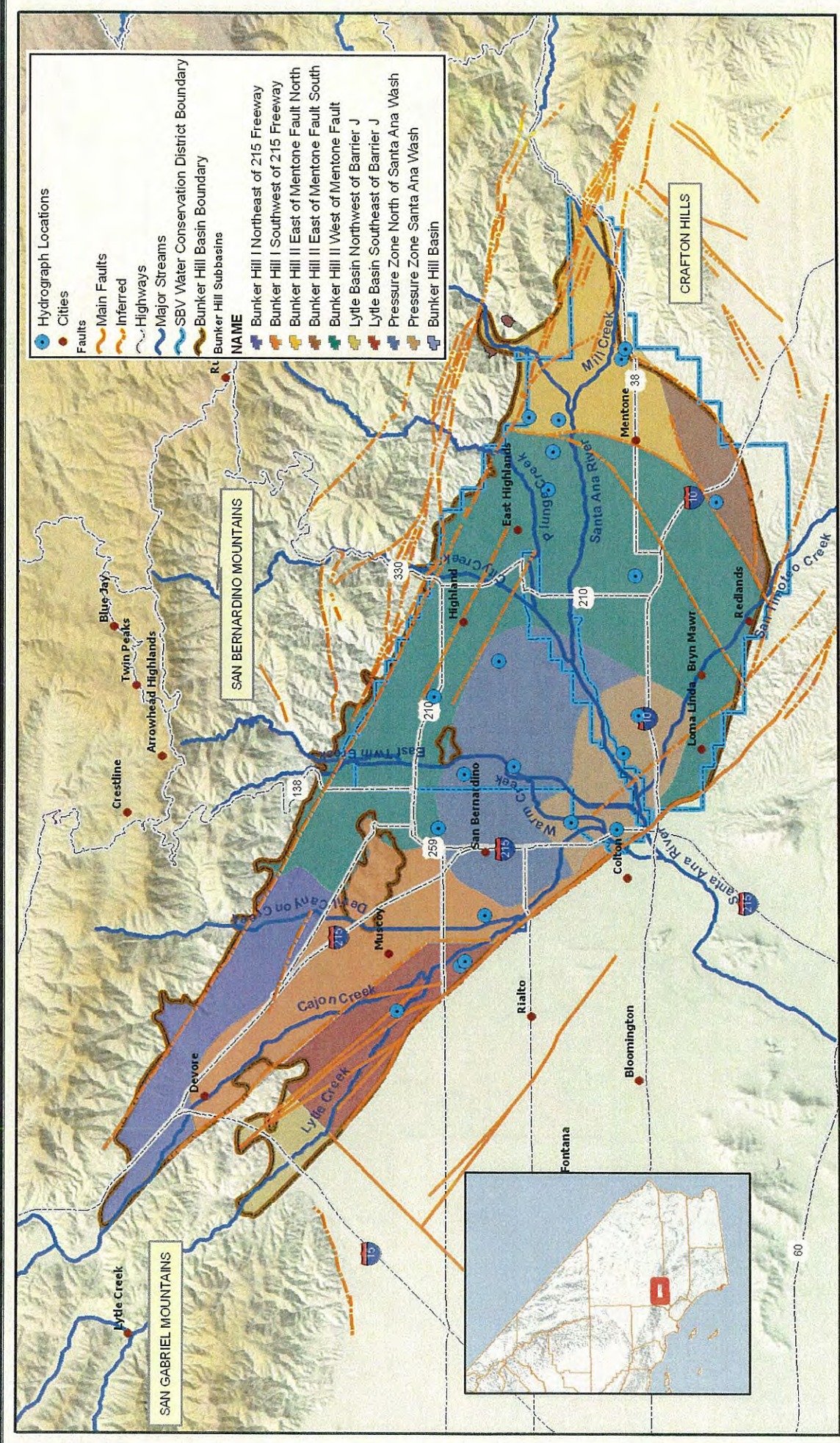
The Bunker Hill Basin is located at the northern-most end of the Santa Ana River Watershed and receives all the surface water runoff from the headwaters of the Santa Ana River, Mill Creek, a portion of the flow from the Lytle Creek area, and smaller periodic flows from Plunge, City, Devil Canyon, Cajon and Elder Creeks. It is part of the inland valley called the San Bernardino Valley located in San Bernardino County, California and encompasses approximately 89,600 acres. Once past the Bunker Hill Basin, the Santa Ana River continues to flow southwesterly for approximately 60 miles until it reaches the Pacific Ocean.

The Bunker Hill Basin is bounded on the northwest by the San Gabriel Mountains, on the northeast by the San Bernardino Mountains, on the south by the Crafton Hills and the Badlands, and on the southwest by a low east-facing escarpment produced by the San Jacinto fault. These Fault expressions are presented on **Figure 2**.

The major streams providing inflows and outflows for the Bunker Hill Basin are also provided on **Figure 2**. The United States Geological Survey (USGS) administers stream flow gauging stations on all of these waterways except Mill Creek. Mill Creek flow is assumed to be 56 percent of the Santa Ana River flow based on historic data. Total diversions for direct use and recharge on the Santa Ana River may exceed the stream flows due to measurements by different agencies.

The Bunker Hill Basin is also expressed by a large group of City and Water Agencies that are working to increasingly collaborate for improved transparency. **Figure 3** presents an overview of the Water Agency Jurisdictions with an overlay of City boundaries.





Engineering Investigation  
 March 2010

Source: SBVWCD GIS  
 L. Pierce

## Bunker Hill Groundwater Subbasins, Faults and Hydrograph Locations 2009 - 2010 Engineering Investigation Report

State Plane  
 NAD 83, Zone V, feet  
 10M DEM DWR  
 Data Sources:  
 SBVWCD, CASIL, SBVMWWD

0 0.5 1 2 3 Miles

Figure 2





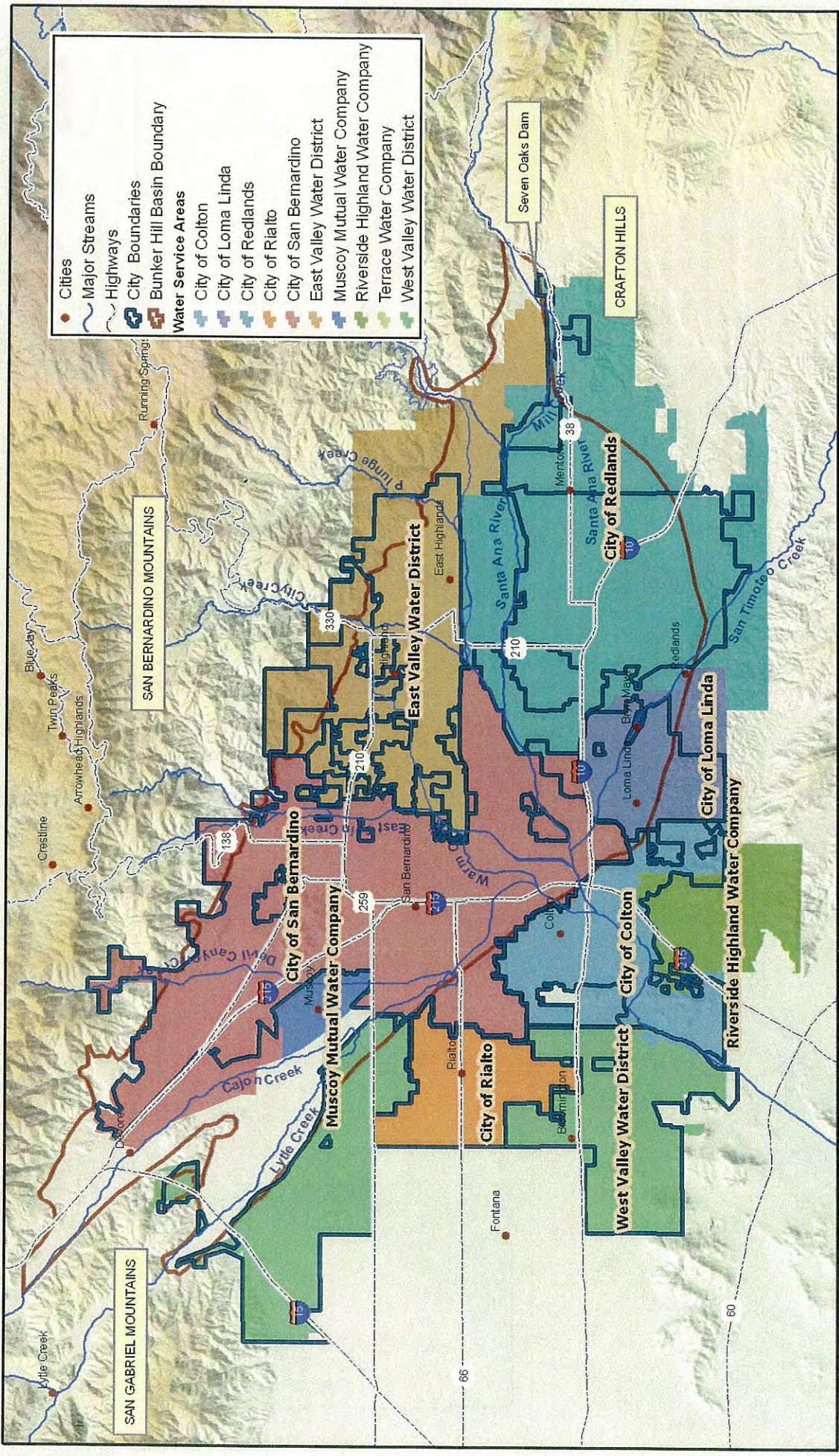
Figure 3

Engineering Investigation  
March 2010

Source: SBVWCD GIS  
L. Pierce

### Bunker Hill Basin and Water Agency Boundaries 2009 - 2010 Engineering Investigation Report

State Plane  
NAD 83, Zone V, feet  
10M DEM DWR  
Data Sources:  
SBVWCD, CASIL, SBVMWD, LAFCO







The climate in the region is a semi-arid Mediterranean-type characterized by long dry summers and relatively short mild winters. The annual average temperature in the valley is 62° F, with extremes ranging from as low as 18° F to as high as 116° F. Precipitation in the region is highly variable depending on location and elevation. Historical annual averages range from 11 inches near Loma Linda Fire Department located at the southwest end of the basin to over 41 inches at Lake Arrowhead located at the upper end of the mountain watershed contributing flow to the basin. Precipitation data provided by the Water Resources Division for 21 stations are summarized in **Table 1** and displayed on **Figure 4**.

### ***2.3 Definition of Terms***

For the purposes of this report, the following terms are defined:

- ◆ Bunker Hill Basin - The Bunker Hill Basin is the groundwater basin that underlies the San Bernardino Valley. By strict definition the Bunker Hill Basin is separate from the Lytle Groundwater Basin, but receives groundwater underflow from the Lytle Basin. For the purposes of this report, the definition of the Bunker Hill Basin is extended to include the Lytle Basin.
- ◆ Production - The term production includes extraction of water by groundwater pumping from wells and surface diversions from the Santa Ana River, Mill Creek, City Creek, Devil Canyon Creek, Cajon Creek, Plunge Creek, and Lytle Creek. 2010 Engineering Investigation utilizes the October to September study time frames throughout the enclosed review and analyses.
- ◆ Current Water Year - As per the California Water Code, the current water year is the period July 1, 2009 through June 30, 2010.
- ◆ Ensuing Water Year - As per the California Water Code, the ensuing water year is the period July 1, 2010 through June 30, 2011.
- ◆ Preceding Water Year - As per the California Water Code, the preceding water year is the period July 1, 2008 through June 30, 2009.

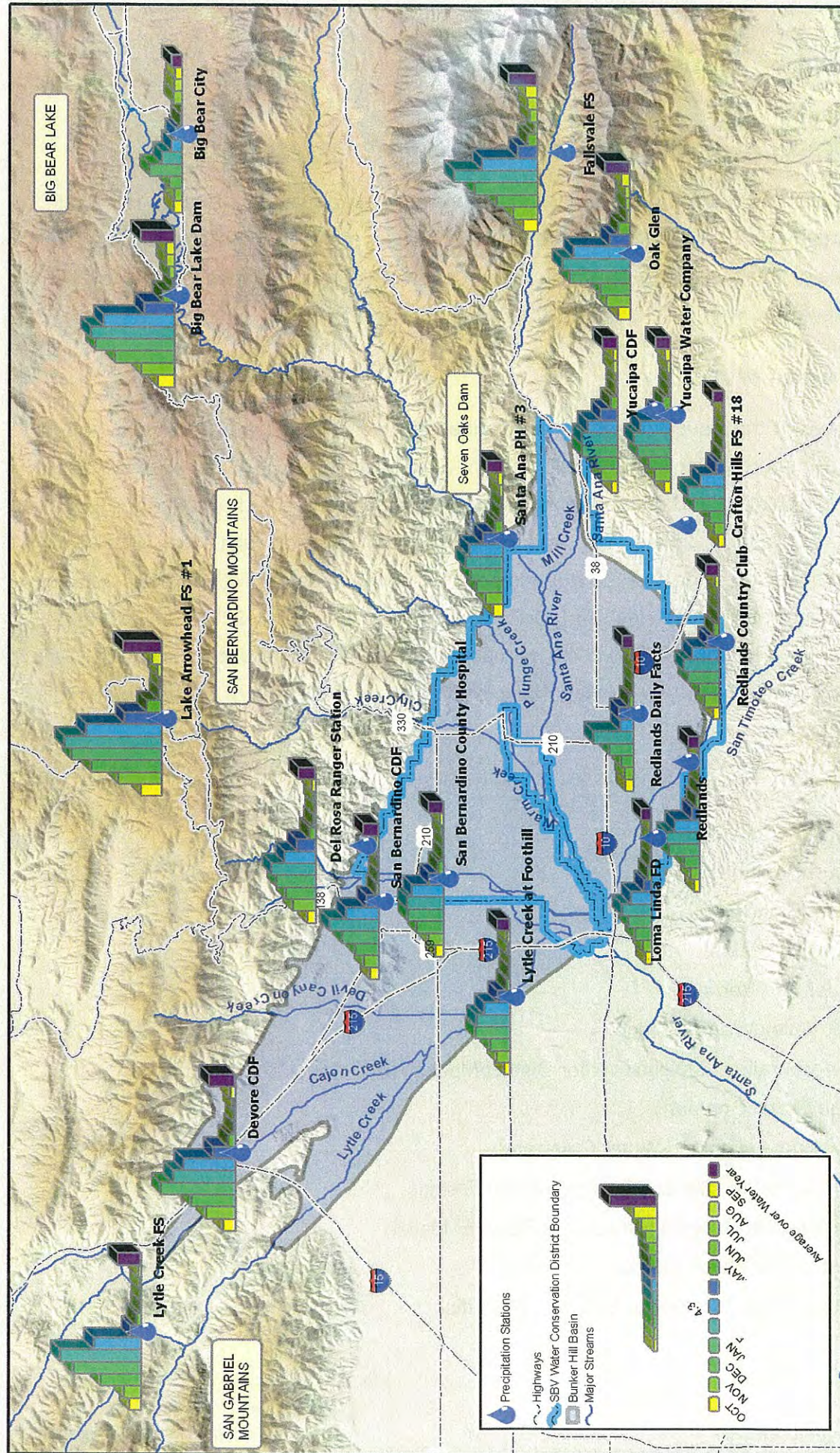
**TABLE 1: Summary of Percentage of Normal Precipitation**  
1983 to 2009 (Water Year - July to June)

Station	Historic Annual Avg. [in]	1983-1984	1984-1985	1985-1986	1986-1987	1987-1988	1988-1989	1989-1990	1990-1991	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	Each Station 16-Yr. Avg. [in]
Big Bear Dam	36.3	19.3	NA	40.3	19.2	28.9	20.8	17.6	34.3	38.9	81.9	28.7	52.7	24.4	30.0	51.7	14.2	20.6	21.4	9.2	38.1	19.6	59.1	26.4	10.3	23.0	56.4	30.7
Custion Hills Dam	12.3	NA	5.9	12.6	9.0	12.1	10.0	6.3	12.3	10.7	23.0	5.5	27.1	7.8	16.7	25.6	7.3	6.4	10.5	2.5	17.6	9.5	31.4	11.5	3.3	13.3	12.4	12.4
Benzer Station	18.4	11.3	15.4	20.1	9.5	18.9	13.2	12.9	8.8	24.2	41.4	12.3	27.7	14.2	17.3	37.3	8.3	12.7	16.6	6.1	10.7	13.0	38.6	17.4	8.8	17.8	18.4	17.8
Diverse CDF	27.6	21.5	24.0	36.8	12.4	17.9	NA	15.0	20.4	31.3	64.0	15.4	45.4	20.6	33.1	45.1	13.6	8.0	15.5	10.9	35.4	16.4	60.4	24.8	8.9	25.2	27.4	26.0
Falls Lake	29.9	19.0	16.9	29.6	23.0	20.3	3.5	16.0	22.5	36.0	71.9	24.7	54.9	22.1	33.8	58.0	16.3	21.2	19.3	6.5	37.5	25.2	61.4	26.9	8.5	29.3	29.8	27.9
Arrowhead Lake	40.6	27.1	30.8	50.6	23.7	40.4	28.5	26.6	23.7	45.2	85.0	28.2	74.5	30.8	36.5	72.8	18.1	25.8	28.6	10.7	36.5	22.7	69.7	46.2	18.5	41.9	41.0	37.9
Loma Linda RD	10.8	6.1	9.2	13.2	7.4	10.5	8.8	7.7	7.2	13.4	25.6	11.0	19.0	7.2	9.8	22.7	5.1	7.7	6.4	2.5	14.5	8.1	22.6	11.1	3.5	9.6	10.7	10.8
Lytic Creek at Football	13.6	8.9	10.2	16.0	7.0	13.0	3.9	8.5	15.5	14.9	31.6	9.2	25.5	12.2	13.8	25.8	6.3	9.8	12.1	4.0	13.6	7.2	27.2	11.2	3.8	11.9	13.6	13.0
Lytic Creek Fire Station	25.3	12.6	19.0	27.6	11.2	22.4	12.8	17.9	32.1	49.1	87.7	20.5	47.6	24.5	23.1	52.2	11.8	20.4	18.3	4.5	17.0	12.1	44.1	18.9	4.2	21.9	26.3	25.4
Oak Glen Reservoir	12.6	5.1	7.7	12.0	9.2	8.9	8.6	6.1	12.6	15.9	23.9	8.4	17.1	9.4	15.7	27.1	4.3	9.1	10.2	4.1	15.0	10.4	24.9	11.0	5.4	10.8	12.7	11.8
Roth	28.9	18.8	22.0	26.0	19.3	21.5	17.8	17.7	26.9	30.8	58.0	18.8	57.9	20.0	30.9	49.5	11.3	17.1	12.3	6.7	14.3	18.4	34.1	22.6	9.7	27.6	27.0	24.2
Redlands Country Club	12.3	5.0	8.7	9.3	7.8	11.2	8.1	7.2	13.3	15.0	25.6	10.1	20.5	8.1	10.8	22.2	6.5	7.4	10.4	3.4	12.2	9.2	24.4	9.5	3.3	9.5	12.2	11.2
Bernardino CDF	14.0	8.2	10.7	13.4	8.8	14.2	10.7	8.6	14.5	16.1	29.4	12.6	19.8	8.5	9.0	17.2	6.3	5.7	10.0	4.0	16.5	11.6	29.4	10.3	4.1	11.9	14.0	12.5
San Bernardino CDF	17.3	11.1	16.1	20.1	9.3	18.3	12.9	10.6	15.5	21.9	37.4	4.5	20.3	15.8	16.2	34.3	9.3	13.6	16.6	5.3	13.1	11.5	37.3	16.4	6.3	18.9	17.1	16.5
Pump House #5	16.4	10.8	12.9	17.9	8.1	13.5	12.6	8.1	15.5	16.5	30.8	11.7	24.1	11.9	18.6	32.7	8.0	11.1	2.3	3.6	17.1	10.5	29.9	13.2	4.7	12.8	16.3	14.4
Yucaipa CDF	17.3	14.2	11.9	15.9	12.3	14.7	NA	10.3	15.8	18.4	23.0	15.9	24.9	11.1	16.6	28.0	7.0	6.8	8.6	3.2	18.2	9.4	27.7	11.8	6.1	10.7	16.1	14.3
Valley Water District	16.2	9.8	10.7	13.0	11.0	11.3	9.7	NA	11.2	17.9	34.2	11.4	30.2	10.5	15.6	24.7	7.6	11.1	9.9	5.7	19.5	11.8	32.7	13.1	6.3	14.7	16.2	14.8
Reynolds Daily Facts	16.4	9.7	12.3	15.2	10.6	NA	NA	NA	17.0	18.7	18.1	12.5	25.2	10.9	16.9	28.6	9.9	9.6	9.7	5.3	19.5	11.1	32.7	12.5	5.5	14.8	16.3	14.9
Big Bear City	13.7	17.6	13.2	19.1	10.2	10.6	9.4	10.2	17.8	14.0	22.9	11.5	18.6	11.2	12.1	16.8	6.5	4.8	20.1	3.3	12.6	7.6	23.3	14.4	3.7	8.5	14.6	12.9

Total Station Average 19.55

Source: San Bernardino County Department of Transportation/Flood Control





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Source: SBVWCD GIS  
L. Pierce

### Precipitation Trends and Station Locations 2009-2010 Engineering Investigation Report

State Plane  
NAD 83, Zone V, feet  
10M DEM DWR  
Data Sources:  
SBVWCD, CASIL

Figure 4





### ***The 2009-3.1 Hydrographs for Key Wells in the Bunker Hill Basin***

To provide an historical perspective of groundwater levels for the Bunker Hill Basin, hydrographs for 21 wells located throughout the basin are shown in **Appendix B**. The locations of these wells are shown on **Figure 2** and the annual changes in water level for these key wells from Fall 2008 to Fall 2009 are shown in **Table 2**.

### ***2.4 Sources of Data***

Data used in the development of this engineering investigation were obtained from a variety of sources including public and private agencies. The data analysis tasks involved tabulating and summarizing information from documented and undocumented reports, public and private files, and personal communication with local, State, and Federal agencies. Some of the more important data sources are listed below. Data for Fall groundwater elevations and preceding water year (Fall 2008 to Fall 2009) production were obtained from the primary water purveyors and its California DWR Contractor, San Bernardino Valley Municipal Water District (Valley) in the Bunker Hill Basin including:

- City of Colton
- City of Loma Linda
- City of Redlands
- City of Rialto
- City of Riverside
- City of San Bernardino
- East Valley Water District
- Elsinore Valley Municipal Water District/Moeks and Daley Water Company
- Gage Canal Company
- Riverside – Highland Water Company
- San Bernardino Valley Municipal Water District
- Watermaster Support Services – Steve E. Mains
- West Valley Water District
- United States Geological Survey, , CA Office



**Table 2**  
**Change in Groundwater Levels in Key Wells**  
*Fall 2008 to Fall 2009*

State Well Number	Well Name	Owner Or Measuring Agency	Fall 2008	Fall 2009	Difference
			Depth To Water [ft]	Depth To Water [ft]	
1S3W06H04S	PL-9A	East Valley Water District	201.6	216.6	-15.0
1N3W30N01S	PL-41	East Valley Water District	299.0	305.6	-6.6
1S2W21E01S	Maguet #2	Redlands, City of	50.0	49.0	1.0
1S2W21D01S	E. Lugonia #6	Redlands, City of	59.0	58.0	1.0
1S3W35G09S	Well #13	Redlands, City of	65.0	69.0	-4.0
1S3W21H06S	Well #30A	Redlands, City of	192.0	199.0	-7.0
1S4W24K01S	Well #34	Redlands, City of	189.0	185.0	4.0
1S4W23A02S	26-1	Riverside, City of - Gage Canal Company	158.0	152.0	6.0
1S4W10N06S	Mill & D Street Well	San Bernardino, City of	85.0	89.5	-4.5
1N4W36G003	16th & Sierra Way	San Bernardino, City of	266.4	265.3	1.1
1N4W27M002S	27th Street Well	San Bernardino, City of	302.8	304.8	-2.0
1S4W02K08S	Antil Well #6	San Bernardino, City of	177.5	198.5	-21.0
1N4W32N01S	Baseline Well	San Bernardino, City of	248.8	256.0	-7.3
1S2W07B01S	SBVWCD #1 (7B01)	San Bernardino Valley WCD	278.9	253.6	25.3
1S2W07K01S	SBVWCD #2 (7K01)	San Bernardino Valley WCD	216.4	204.3	12.1
1S3W12J01S	SBVWCD #3 (12J01)	San Bernardino Valley WCD	225.8	226.8	-1.0
1S3W11H01S	SBVWCD #4 (11H01)	San Bernardino Valley WCD	181.2	195.2	-14.0
1N5W23Q01S	2/Lower 7	West Valley Water District	166.0	254.0	-88.0
1N5W36H04S	7/Lord 7	West Valley Water District	N/A	N/A	N/A
1N5W25E001S	05A/Lower 5	West Valley Water District	190.0	261.0	-71.0





Data regarding historic diversions from the Santa Ana River, Mill Creek, Plunge Creek, City Creek, Devil Canyon Creek, Cajon Creek, and Lytle Creek were obtained from the following sources:

- San Bernardino Valley Water Conservation District (acting as Project Manager for the Cooperative Water Project - Exchange Plan)
- Western Municipal Water District
- City of San Bernardino
- Watermaster Support Services – Steve E. Mains
- San Bernardino Valley Municipal Water District (Valley)
- Cities of Redlands, San Bernardino, others
- East Valley Water District

Historic precipitation data were obtained from the following sources:

- San Bernardino County Department of Transportation and Flood Control
- Redlands Daily Facts
- Big Bear Grizzly
- Big Bear Water District
- The Weather Warehouse

### **3.0 Fall 2008 Groundwater Elevation Contours**

The District, the Western Municipal Water District, and the primary water purveyors in the Bunker Hill Basin provided Fall 2009 water level data. Static groundwater elevations for Fall 2009 for wells throughout the Bunker Hill Basin are compiled in **Appendix A**. These Water elevation locations and contours using 182 wells using a Geographic Information System (GIS) are plotted on **Figures 5 & 7** for Fall 2008 and Fall 2009, respectively. The water elevation values were used to derive an interpolated surface for the extent of the Bunker Hill Basin. For purposes of comparison, Fall 2008 and Fall 2009 static groundwater elevation surface contours are provided on **Figures 6 & 8** Fall 2008 and Fall 2009, respectively..



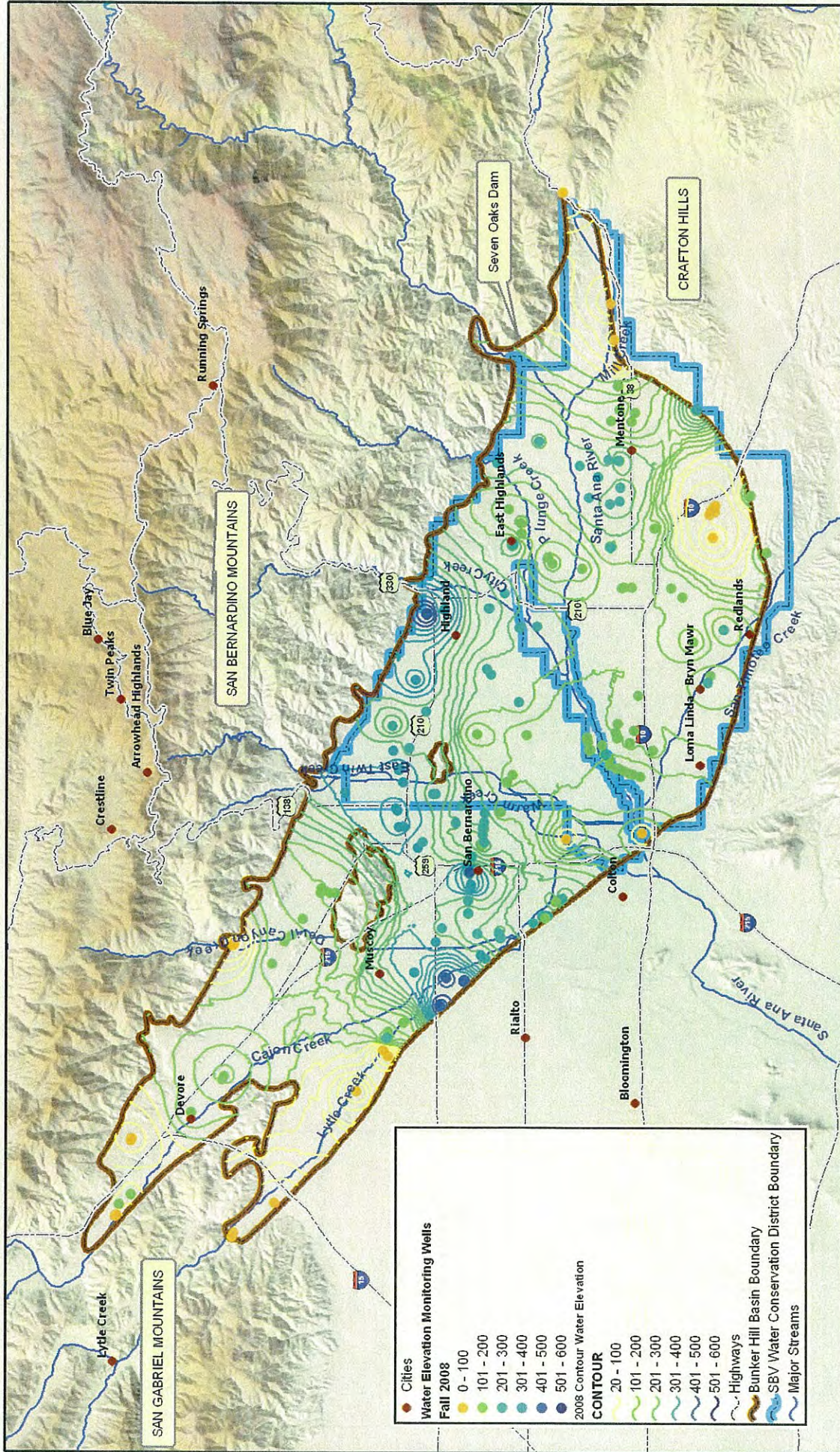


Figure 5

Engineering Investigation  
March 2010

Source: SBVMWD GIS  
L. Pierce

**Water Elevation By Well Location  
with Contours Fall 2008  
2009 - 2010  
Engineering Investigation Report**

State Plane  
NAD 83, Zone V, feet  
10M DEM DWR  
Data Sources:  
SBVMWD Water Elevation  
2008 - 2009  
Watermaster Services,  
All City Water Agencies  
and SBVMWD





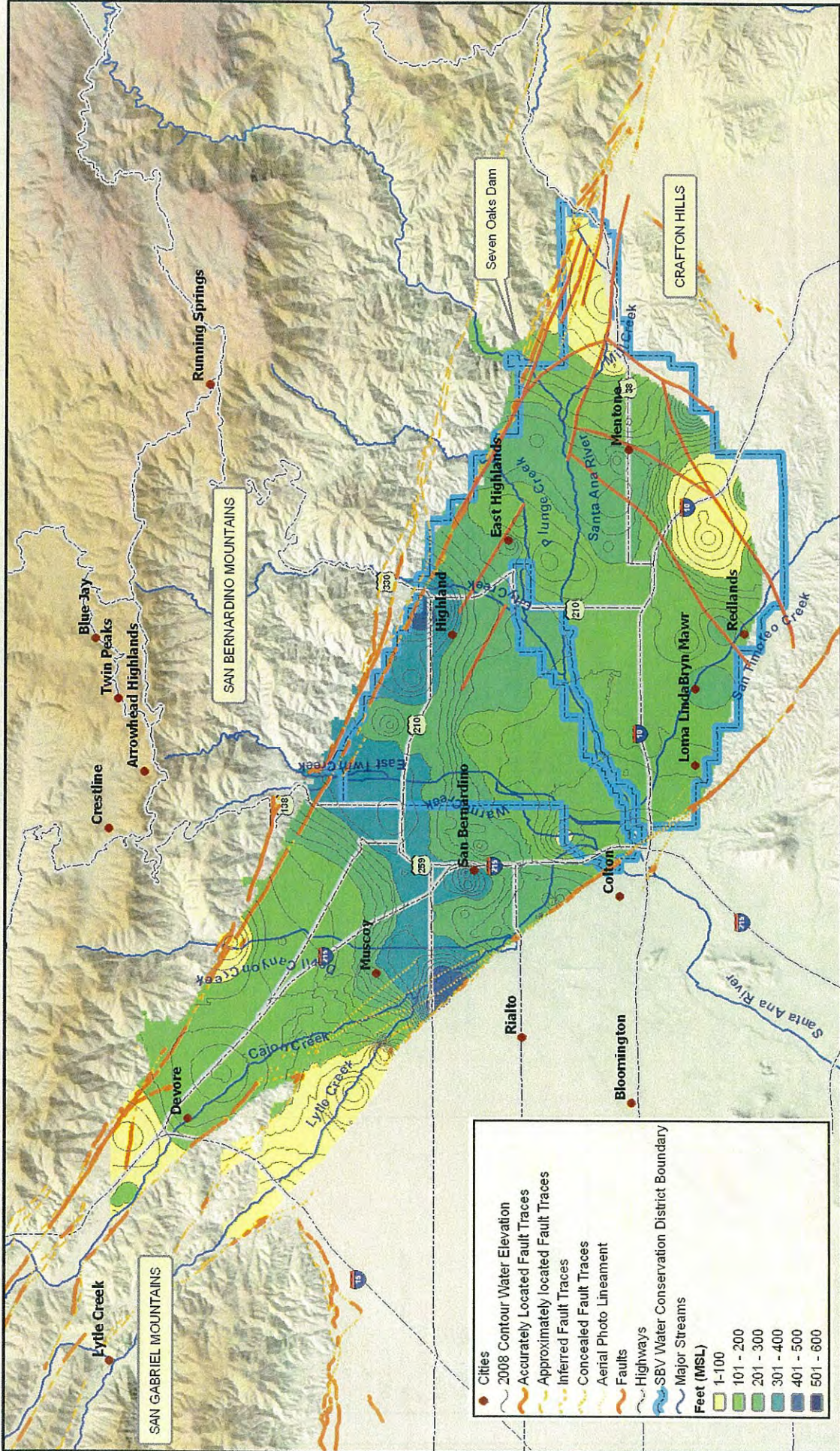
Figure 6

Engineering Investigation  
March 2010

Source: SBVWCD GIS  
L. Pierce

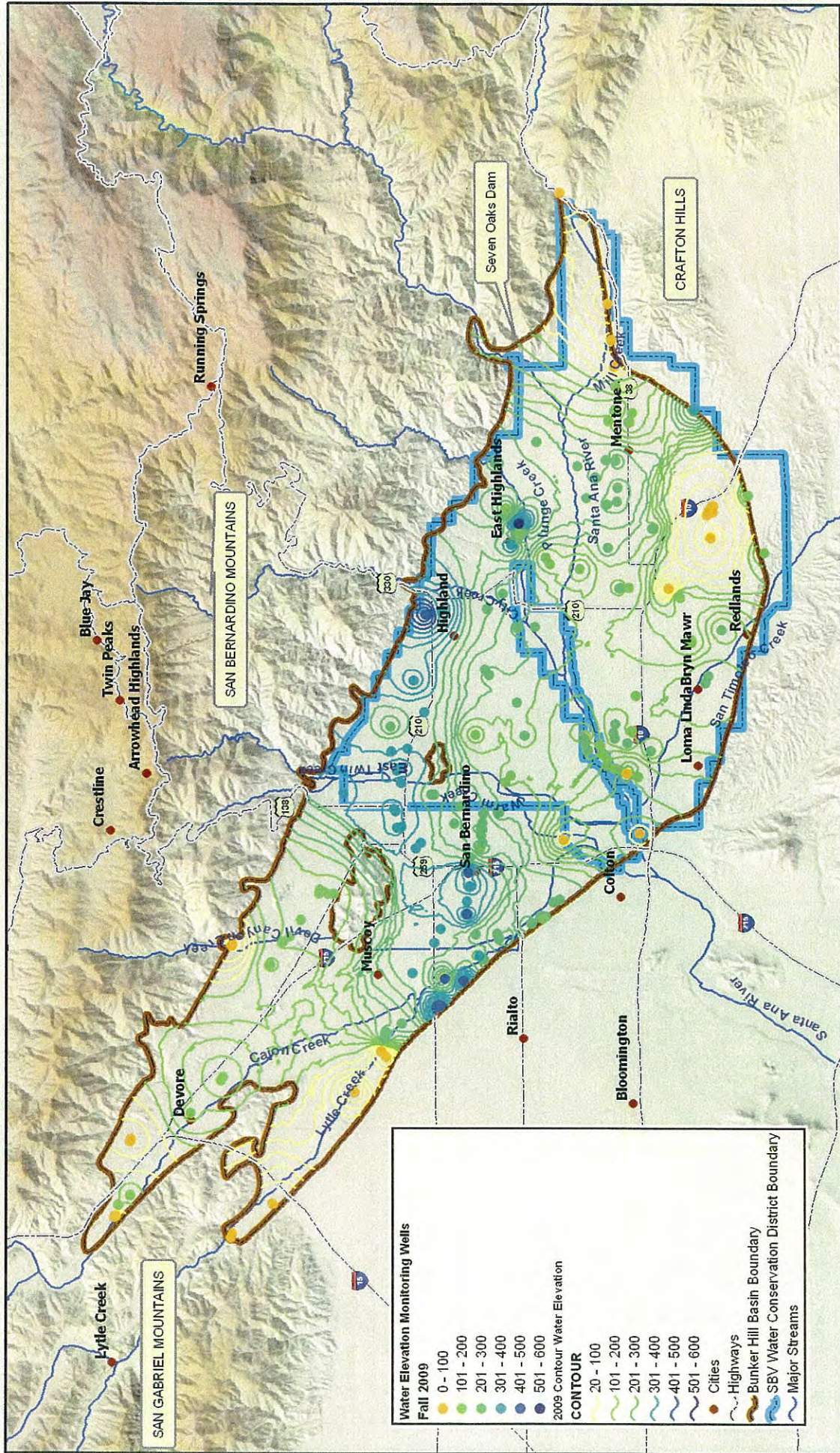
# Water Elevation Contour Surface Fall 2008 2009-2010 Engineering Investigation Report

State Plane  
NAD 83, Zone V, feet  
10M DEM DWR  
Data Sources:  
SBVWCD Water Elevation  
2008-2009  
Watermaster Services,  
All City Water Agencies  
and SBVWWD



	Cities
	2008 Contour Water Elevation
	Accurately Located Fault Traces
	Approximately Located Fault Traces
	Inferred Fault Traces
	Concealed Fault Traces
	Aerial Photo Lineament
	Faults
	Highways
	SBV Water Conservation District Boundary
	Major Streams
	Feet (MSL)
	1-100
	101 - 200
	201 - 300
	301 - 400
	401 - 500
	501 - 600





Engineering Investigation  
March 2010

Source: SBVMWD GIS  
L. Pierce

Figure 7

**Water Elevation By Well Location  
with Contours Fall 2009  
2009 - 2010  
Engineering Investigation Report**

State Plane  
NAD 83, Zone V, feet  
10M DEM DWR  
Data Sources:  
SBVMWD Water Elevation  
2008 - 2009  
Watermaster Services,  
All City Water Agencies  
and SBVMWD





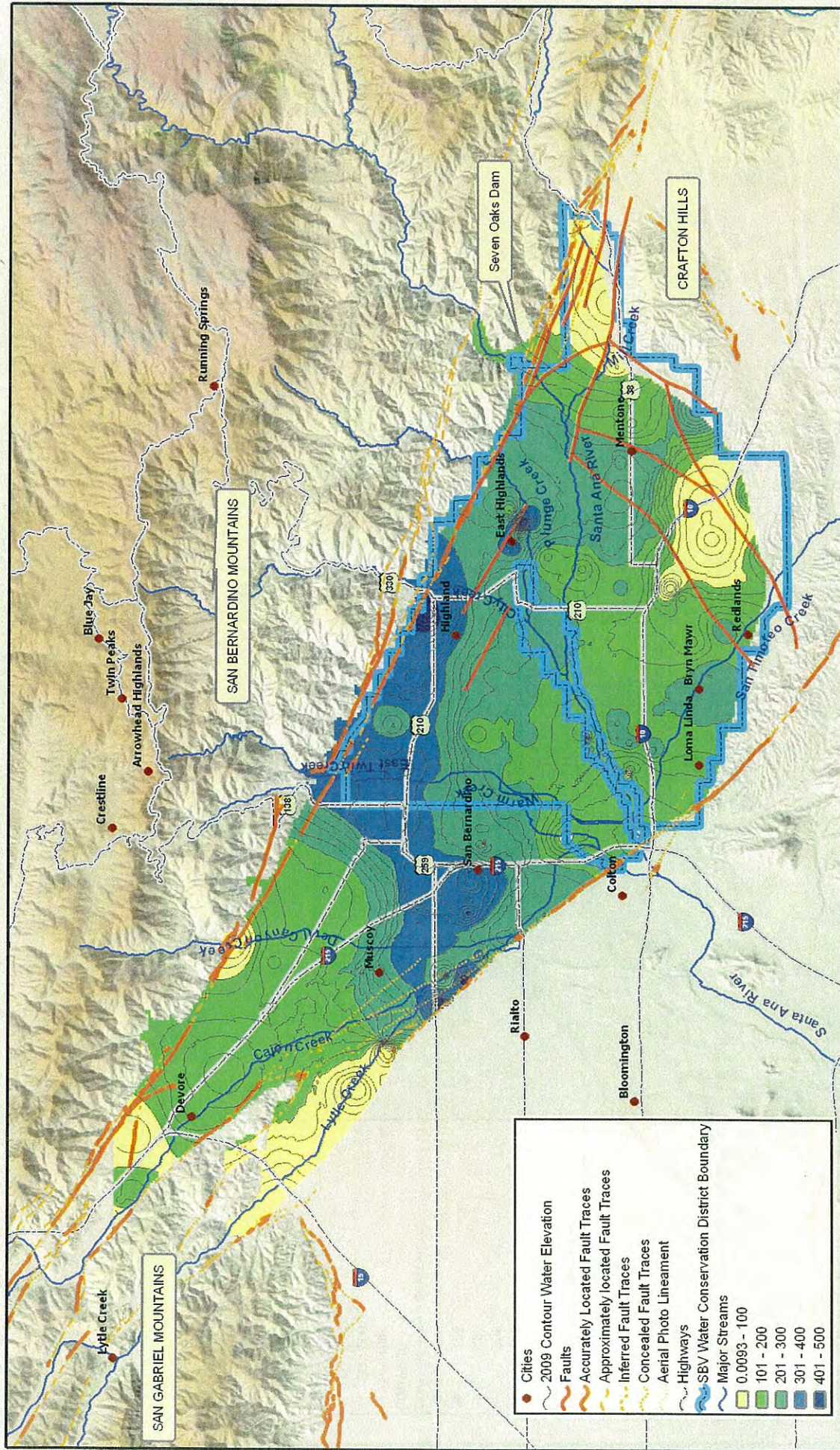


Figure 8

Engineering Investigation  
March 2010

Source: SBVMWCD GIS  
L. Pierce

## Water Elevation Contour Surface Fall 2009 2009 - 2010 Engineering Investigation Report



State Plane  
NAD 83, Zone V, feet  
10M DEM DWR

Data Sources:  
SBVMWCD Water Elevation  
2008 - 2009  
Watermaster Services,  
All City Water Agencies  
and SBVMWCD





## **4.0 Task 1 - Annual Change in Storage (Fall 2008 to Fall 2009)**

### **4.1 Hydrologic Sub-areas**

Using a Geographic Information System, the average groundwater elevation changes were determined for each of the eight hydrologic sub-areas shown on **Figure 2** (Page 14) and listed below.

- Bunker Hill I - Southwest of Interstate 215
- Bunker Hill I - Northeast of Interstate 215
- Bunker Hill II - West of Mentone Fault
- Bunker Hill II - East of Mentone Fault
- Lytle Basin - Southeast of Barrier J
- Lytle Basin - Northwest of Barrier J
- Pressure Zone - North of Santa Ana Wash
- Pressure Zone - Santa Ana Wash

Due to variations of changes in groundwater level elevation, the Bunker Hill II - East of Mentone Fault was further subdivided into storage units North of Redlands Fault and Southeast of Redlands Fault.

### **4.2 Area and Storativity**

Each sub-area and storage unit was digitized to estimate its storage area. Average storativity for each sub-area was determined based on data from Hardt and Hutchinson (1980). Both of these values are shown in **Table 3**. Storativity values ranged from 0.02 for the Pressure Zone to 0.13 for the Lytle Basin - Northwest of Barrier J and Bunker Hill II - East of the Mentone Fault.

### **4.3 Groundwater Level Elevation Changes**

In order to determine the annual change in storage for the Bunker Hill Basin, Fall 2009 groundwater level elevation data were compared with the same from Fall 2008. Measurements for 210 wells, 161 of which had values for comparison that were available for both periods are provided in **Appendix A**.



Average changes in groundwater levels were determined by averaging the changes for all wells in each of the eight sub-areas and storage units as shown in **Table 3**.

#### **4.4 Change in Groundwater Storage**

The total annual change in storage for the Bunker Hill Basin was determined by summing the changes from each sub-area. Changes in groundwater storage for the period July 2009 to June 2010 for the Bunker Hill Basin were calculated using the following formula:

$$Q_{\Delta \text{ storage}} = \sum A_i \times S_i \times \Delta h_i .$$

where:

- $Q_{\Delta \text{ storage}}$  = Annual change in storage for the Bunker Hill Basin, (acre-feet)
- $A_i$  = Area of sub-area and storage unit  $i$ , (acres)
- $S_i$  = Storativity of sub-area and storage unit  $i$
- $\Delta h_i$  = Average water level change of sub-area and storage unit  $i$ , (feet)

As shown in **Table 3**, the change in groundwater stored in the Bunker Hill Basin between Fall 2008 and Fall 2009 was decreased by **35,600 acre-feet** .

**Table 3: Annual Change in Storage for Bunker Hill Basin  
Fall 2008 to Fall 2009**

Sub-area	[1] Avg. Fall 2008 Water Depth* [ft.]	[2] Avg 2009 Water Depth.* [ft.]	[3] Annual Change in Water Level* [ft.]	[4] Area [acres]	[5] Storativity (S)	[6] Annual Change in Storage** [acre-ft]
Bunker Hill I - Southwest of Interstate 215	247.0313	247.5062	-0.47	11,714	0.09	-501
Bunker Hill I - Northeast of Interstate 215	79.0750	85.3167	-6.24	7,795	0.11	-5,352
Bunker Hill II - West of Mentone Fault	244.4818	256.2636	-11.78	35,206	0.06	-24,887
Bunker Hill II - East of Mentone Fault North	110.4727	111.7727	-1.30	8,584	0.13	-1,451
Bunker Hill II - East of Mentone Fault South	113.3730	90.4000	22.97	2,507	0.13	7,488
Lytle Basin - Southeast of Barrier J	319.0303	319.5367	-0.51	5,237	0.07	-186
Lytle Basin - Northwest of Barrier J	97.6667	97.0833	0.58	1,924	0.13	146
Pressure Zone - North of Santa Ana Wash	217.3125	234.7125	-17.40	11,920	0.02	-4,148
Pressure Zone - Santa Ana Wash	162.0200	167.4174	-5.40	6,686	0.02	-722
Total				91,573		

**Total =	-35,600
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[1], [2], [3] Based on average changes in water level within each Sub-area

[4] Estimated using GIS 161 Wells

[5] Based on data from Hardt and Hutchinson (1980). S, storativity: The amount of water stored or released per unit area of aquifer given unit head change.

[6] = [3] x [4] x [5]

\* A positive sign denotes an increase in water level and a negative sign represents a decline in water level.

\*\* A positive sign denotes an increase in storage and a negative sign represents a decline of storage.





## 5.0 **Task 2** - Accumulated Change in Storage (Fall 1993 to Fall 2009)

For purposes of this report, the accumulated change in storage as of the last day of the preceding water year (September 30, 2009) was based on the changes in water levels between Fall 1993, when the accumulated basin change in storage was considered “zero”, and the Fall of 2009.<sup>2</sup> The accumulated change in storage as of September 30, 2009 was determined by algebraically adding the change in storage for the preceding calculated year (July 1, 2008 to June 30, 2009 of -35,600 acre-feet), determined in Section 4.4, to the accumulated change in storage as of June 30, 2008 (-362,000). The result of this calculation shows an increase in stored water and an accumulated decrease in water storage capacity of -397,600 acre-feet.

**Table 4** summarizes the accumulated change in storage of the Bunker Hill Basin for the period 1988 to 2009 based on 1993 as the “zero accumulated storage year”. As would be expected, stored underground water generally increases with above average rainfall and decreases with normal and below average rainfall.

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<sup>2</sup> In the District's Engineering Investigation (EI) prior to 1993-94, the accumulated change in storage was based on the basin storage in 1984 as considered full. A concern arose regarding the flooding of basements due to high groundwater levels in the Pressure Zone of the Bunker Hill Basin. Therefore, in response to the City of San Bernardino's comments on accumulated change in storage, all EI's since that time are based on 1993 basin storage levels considered as full.



**Table 4      Accumulated Change in Storage for Bunker Hill Basin, 1988 to 2009**

Year	Accumulated Storage [acre-ft]
1989	-58,000
1990	-170,700
1991	-196,000
1992	-191,000
1993	0
1994	-50,000
1995	41,100
1996	-43,100
1997	-75,500
1998	40,400
1999	-85,700
2000	-131,100
2001	-212,200
2002	-301,500
2003	-338,800
2004	-406,900
2005	-183,100
2006	-245,500
2007	-359,400
2008	-362,000
2009	<b>-397,600</b>

Note: A negative sign indicates a decline in storage and a positive sign represents an increase in storage.



## 6.0 **Task 3** - Total Groundwater Production for the Preceding Water Year (June 1, 2008 to July 30, 2009)

Production data for the preceding water year (July 1, 2008 to June 30, 2009) for the Bunker Hill Basin were obtained from the primary water purveyors as listed in Section 2.4. Production data for all wells, including those owned by some smaller water agencies were included if data were available from the Western - San Bernardino Watermaster, Western Municipal Water District, and semiannual billing statements issued by the SBWCD respectively.

**Appendix C** shows the production for each groundwater well in the Bunker Hill Basin for the period July 2008 through June 2009. As summarized on the last page of the appendix, groundwater production from the Bunker Hill Basin for the preceding water year was approximately 188,951 acre-feet. **Table 5** summarizes the Bunker Hill Basin groundwater production for each of the sub-areas defined in Section 4.1.

Groundwater production within the Bunker Hill Basin during the period October 2008 through September 2009 is shown on **Figure 9**. The Pressure Zone has the greatest density of higher producing facilities with pockets of substantial production scattered throughout the rest of the basin. **Figure 9** depicts the monthly groundwater production values for each subbasin using the average of 218 wells.

**Table 5 Production in Sub-Basins of the Bunker Hill Basin  
Preceding Water Year (October 2008 to September 2009)**

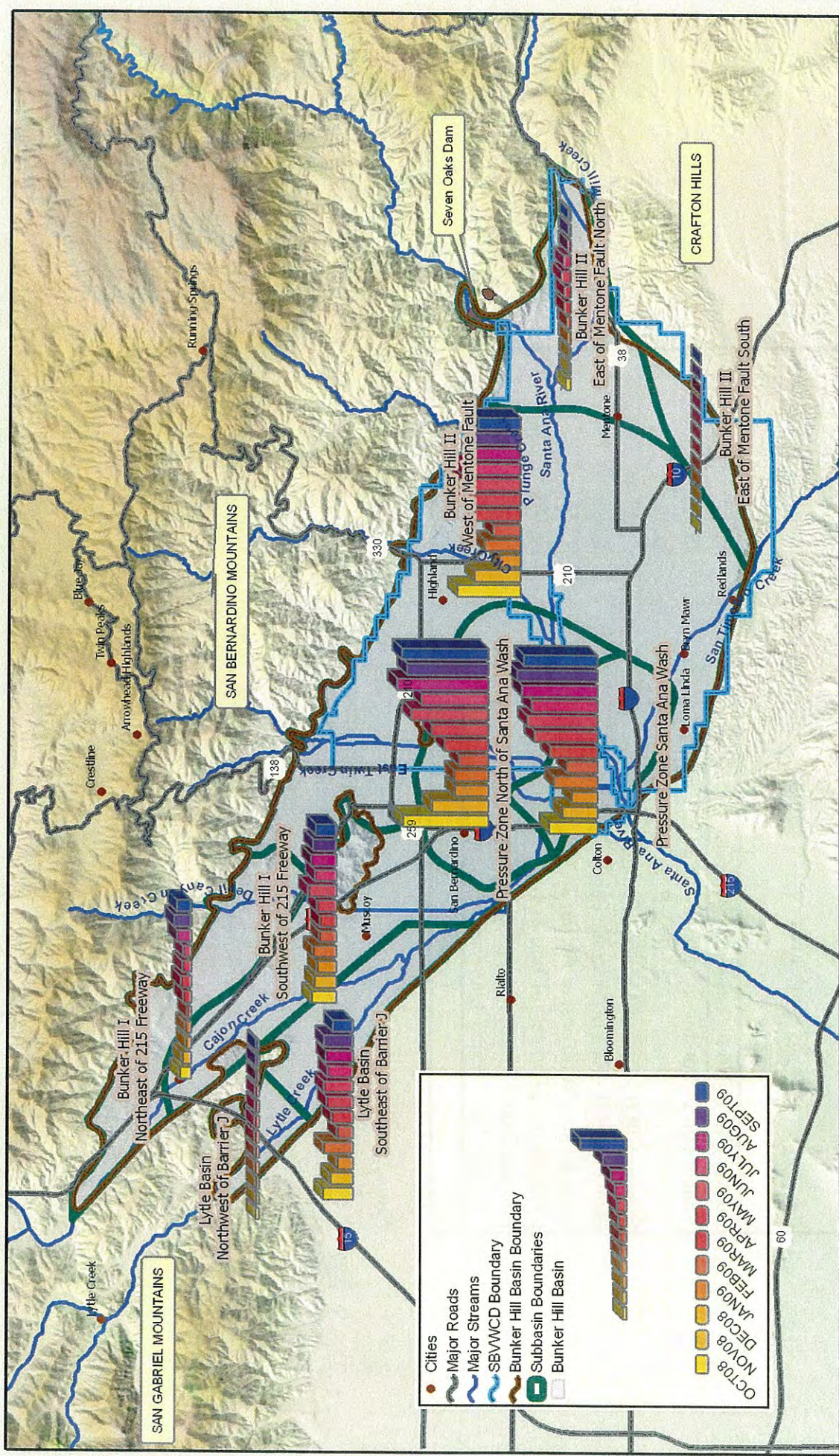
Sub-area	Production October 2008 to September 2009 [acre-ft]
Bunker Hill I - Northeast of Interstate 215	7,385
Bunker Hill I - Southwest of Interstate 215	15,321
Bunker Hill II - West of Mentone Fault	34,895
Bunker Hill II - East of Mentone Fault, North	5,719
Bunker Hill II - East of Mentone Fault, South	1,681
Lytle Basin - Northwest of Barrier J	2,553
Lytle Basin - Southeast of Barrier J	17,768
Pressure Zone - North of Santa Ana Wash	71,777
Pressure Zone - Santa Ana Wash	31,853
<b>Total</b>	<b>188,951</b>

**Notes:**

- 1 - Estimated from prior water year (Oct 2008-September 2009) production.
- 2 - Estimated for Water Year Oct 2008-September 2009 Production.
- 3 - Refer to Appendix C for Well Values Compiled for Estimate

*Data Sources: 25 Primary Water Purveyors, as well as San Bernardino Watermaster, and SBVWWD*





Engineering Investigation  
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Source: SBVWCD GIS  
L. Pierce

## Groundwater Production - Bunker Hill Basin Subbasins October 2008 - September 2009 (Water Year) 2009 - 2010 Engineering Investigation Report

State Plane  
NAD 83, Zone V, feet  
10M DEM DWR  
Data Sources:  
SBVWCD  
218 Wells Production summary

0 0.5 1 2 3 Miles

Figure 9





## 7.0 ***Task 4*** - Estimate of the Annual Change in Storage for the Current Water Year (July 1, 2009 to June 30, 2010)

To estimate annual change in storage for the current water year, a multiple regression analysis was performed for the period between 1991-92 and 2004-05 for three parameters.

- Annual Change in Storage
- Precipitation
- Production

In Engineering Investigations (EI) prior to 1998, data for the period 1982 calendar year through 1991 calendar year were also utilized in the regression analysis. The only production data available for this time frame were based on a calendar year period instead of the June to July period required in the EI. Since 1991-92, more complete and accurate production data for the July to June period have become available as the District has compiled detailed information for its EI. Since 1998, the regression analysis has not included pre-1991 data to more accurately represent June through July production.

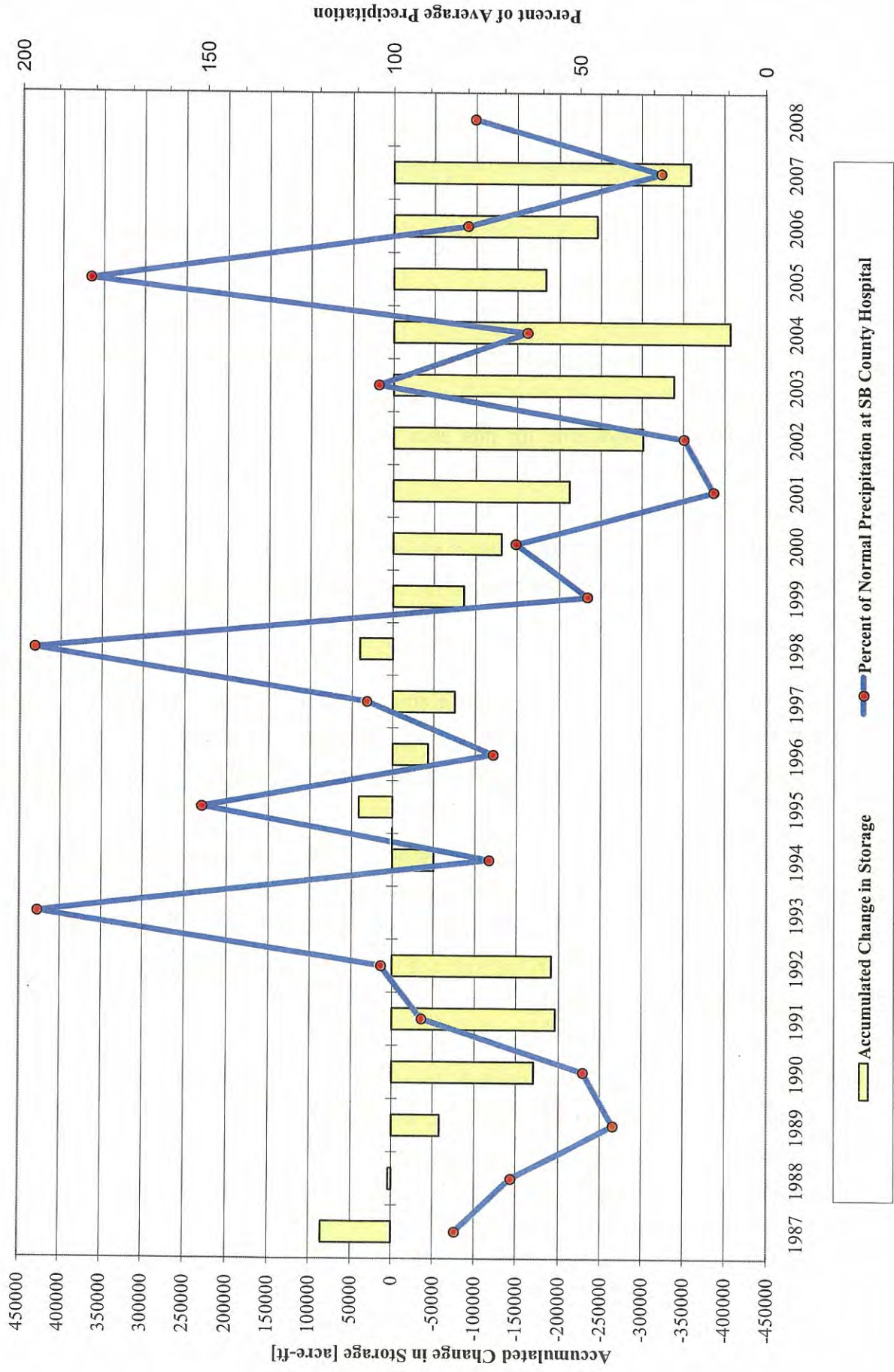
Annual change in storage for the current water year is estimated using the following relationship between change in storage, precipitation, production, and the calculated regression coefficients. The accumulated change in storage is shown in **Figure 10**.

A nomograph, constructed using the above equation, is shown on **Figure 11**. Through the use of this chart or the equation above, annual change in storage can be estimated for a given set of annual precipitation and production values. The precipitation used in the nomograph is based on the average of the representative Bunker Hill Basin drainage area stations listed in **Table 6**.

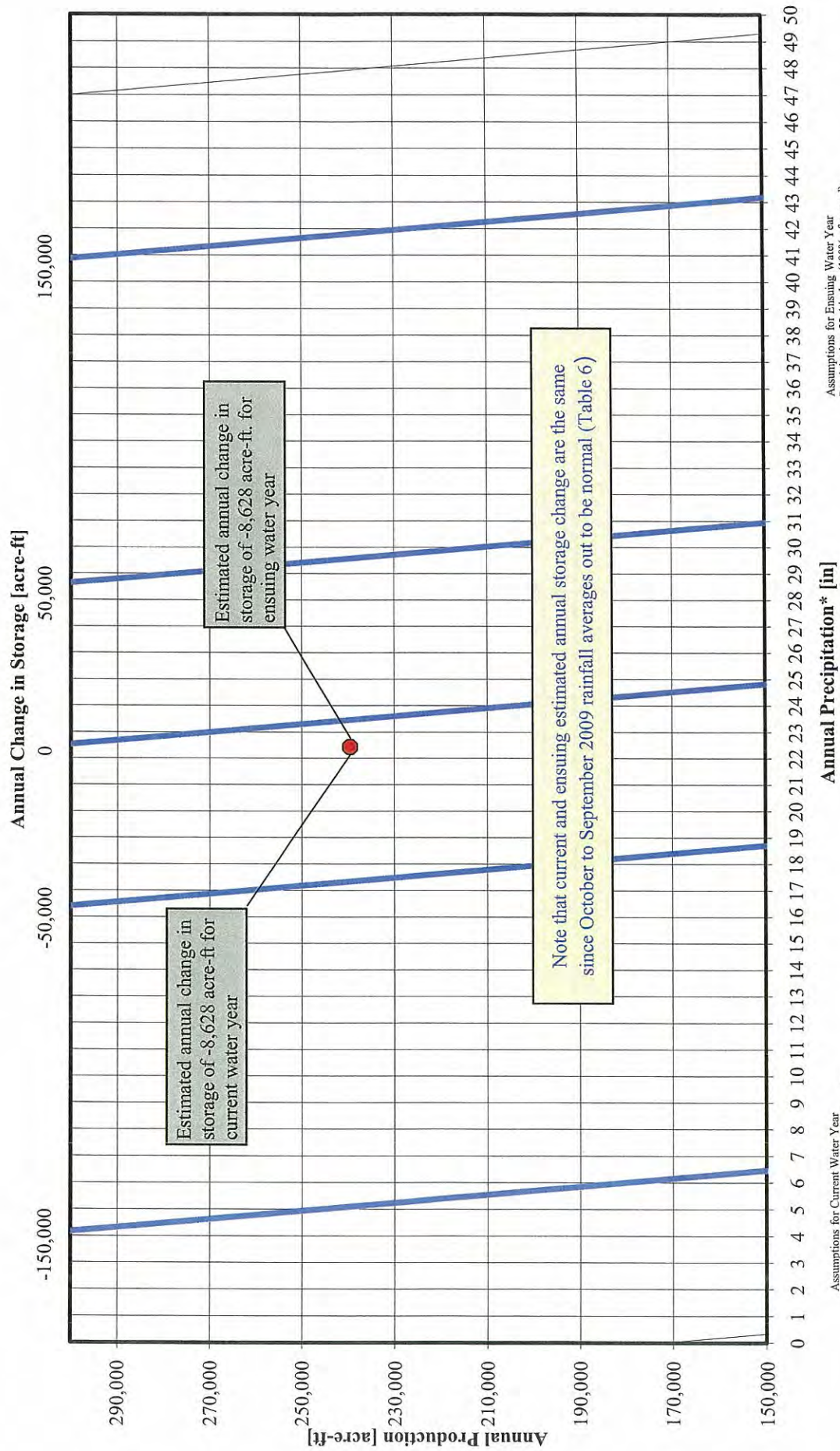
The average annual precipitation for eight of the ten stations with recent data is approximately 15.5 inches (**Table 6**), while the total for the preceding water year was 22.5 inches (107 percent of normal). Historic annual precipitation values are plotted in **Appendix D** for these eight stations and twelve other local stations.

# Accumulated Change in Storage for Bunker Hill Basin

## 1987 to 2009 (Based on "Zero Year" of 1993)



# Prediction Chart for Annual Change in Storage Current and Ensuing Water Years



\* Based on Big Bear Dam, Devore CDF, Lake Arrowhead, Mentone CDF, Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.



**Table 6: Estimates of Percentage of Normal Precipitation for Current Water Year ( October 2009 - September 2010)**

Station	July to June	July. to June	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Historic Average Annual	2008-2009	Season - July to December		Season - January to June			Jul. 2008 to Jun. 2009	
	[inches]	[inches]	Historic Average	Sum Jul 2008 to Dec 2008	% of Normal	Historic Average	Sum Jan 2009 to Jun 2009	% of Normal	Water Year % of Normal
	[inches]	[inches]	[inches]	[inches]	[%]	[inches]	[inches]	[%]	[%]
Big Bear Dam	35.7	25.5	11.82	8.82	75%	24.85	16.65	67%	69%
Camp Angelus	10.3	6.27	10.28	4.22	41%	20.17	2.05	10%	21%
Devore CDF	27.6	23.9	8.22	7.57	92%	19.36	8.94	46%	60%
Lake Arrowhead	40.7	29.9	13.18	15.19	115%	27.97	14.69	53%	73%
Mentone CDF	12.6	9.4	3.77	5.41	144%	8.99	3.97	44%	74%
Mill Creek Intake #3 (Inoperable)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Redlands Country Club	14.0	12.8	4.16	3.41	82%	10.00	12.77	128%	114%
San Bernardino County Hospital	16.2	10.1	5.10	4.87	95%	11.38	5.18	46%	61%
Santa Ana Pumpbouse #3	17.2	9.7	5.49	9.71	177%	11.75	4.46	38%	82%
Yucaipa CDF	15.9	12.1	4.93	5.77	117%	11.22	6.35	57%	75%
Average (inches) =		21.1	15.5	Average = 104%		Average = 54%		2008-09 Average = 70%	

[1], [4]: Based on data provided by San Bernardino County Department of Transportation/Flood Control

[3] = ([2] / [1]) x 100

[5] Assumed equal to season average (January to June)

[6] = ([5] / [4]) x 100

[7] = (([2] + [5]) / ([1] + [4])) x 100



**Table 6** shows that for the period between July 1, 2008 and December 31, 2008, precipitation was 104 percent of normal for the eight stations with data. For the remainder of the water year, January 1 to June 30, 2009, the rainfall averaged 54% of the long term average. Annually, precipitation for the 2008-09 water year averaged 70%. For purposes of this report, it was assumed that precipitation for the ensuing water year (July 1, 2010 to June 30, 2011) would be average, or 21.1 inches. Therefore, precipitation for the ensuing water year (July 1, 2010 to June 30, 2011) was estimated to be 100 percent of normal or 21.1 inches of rainfall (1.00 x 21.1).

Based on these assumptions, the estimated production for the current water year will be approximately 239,850 acre-feet as shown on **Figure 12**. Using this result on **Figure 11**, an estimated change in storage for the current water year (July 1, 2009 to June 30, 2010) of -12,638 acre-feet was determined.

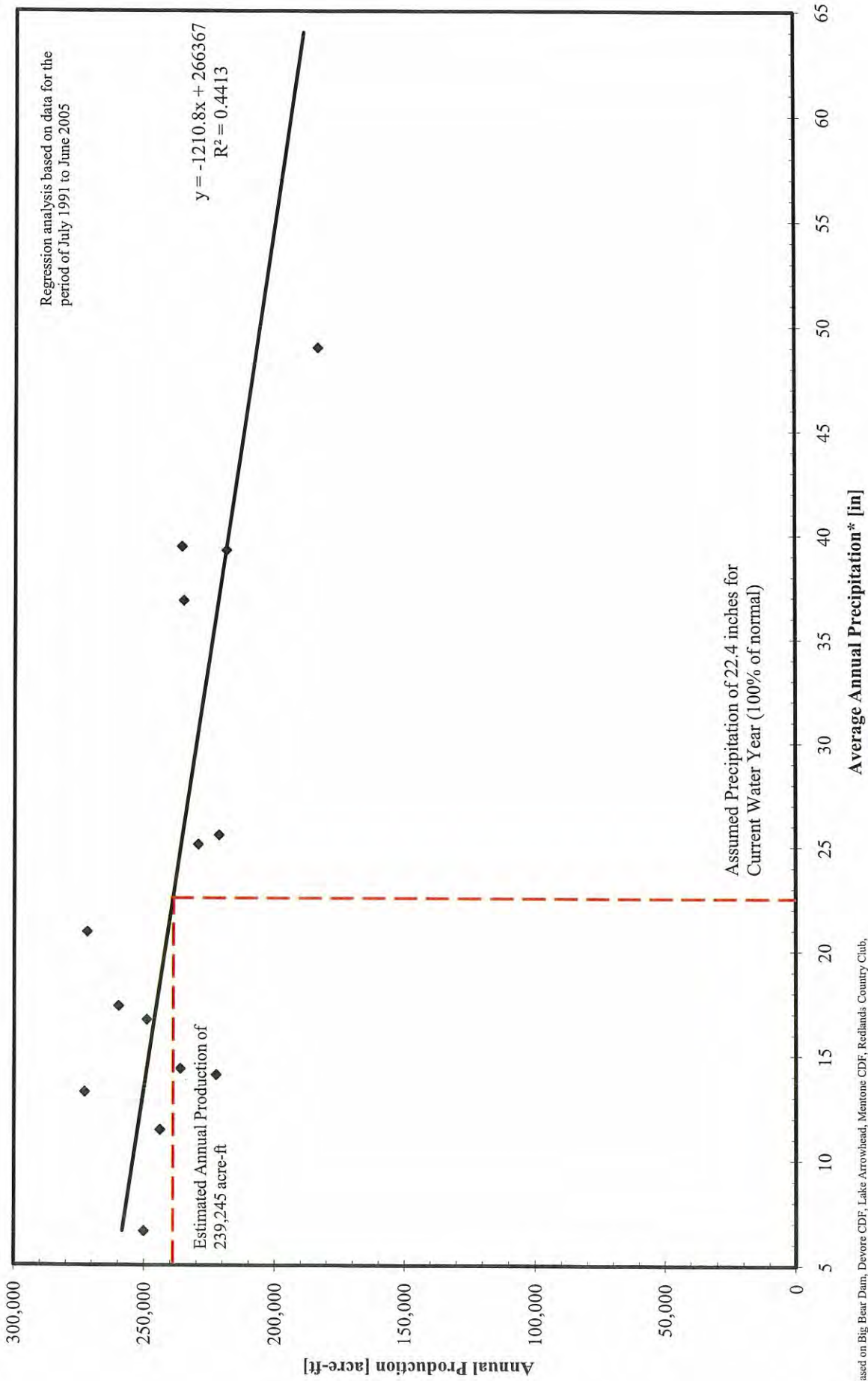
### **8.0 Task 5 - Estimate of the Annual Change in Storage for the Ensuing Water Year (July 1, 2010 to June 30, 2011)**

The annual change in storage for the ensuing water year (July 1, 2010 to June 30, 2011) was estimated using the same method as described in Section 7.0. It was assumed that precipitation for the ensuing water year would be 100 percent of normal or 21.1 inches. Based on this assumption, the estimated production for the ensuing water year will be approximately 239,850 acre-feet as shown on **Figure 13**. Again, using this result in the nomograph shown on **Figure 11**, the estimated annual change in storage for the ensuing water year (July 1, 2010 to June 30, 2011) is -12,638 acre-feet.

### **9.0 Task 6 - Average Annual Change in Storage for the Immediate Past Ten Water Years**

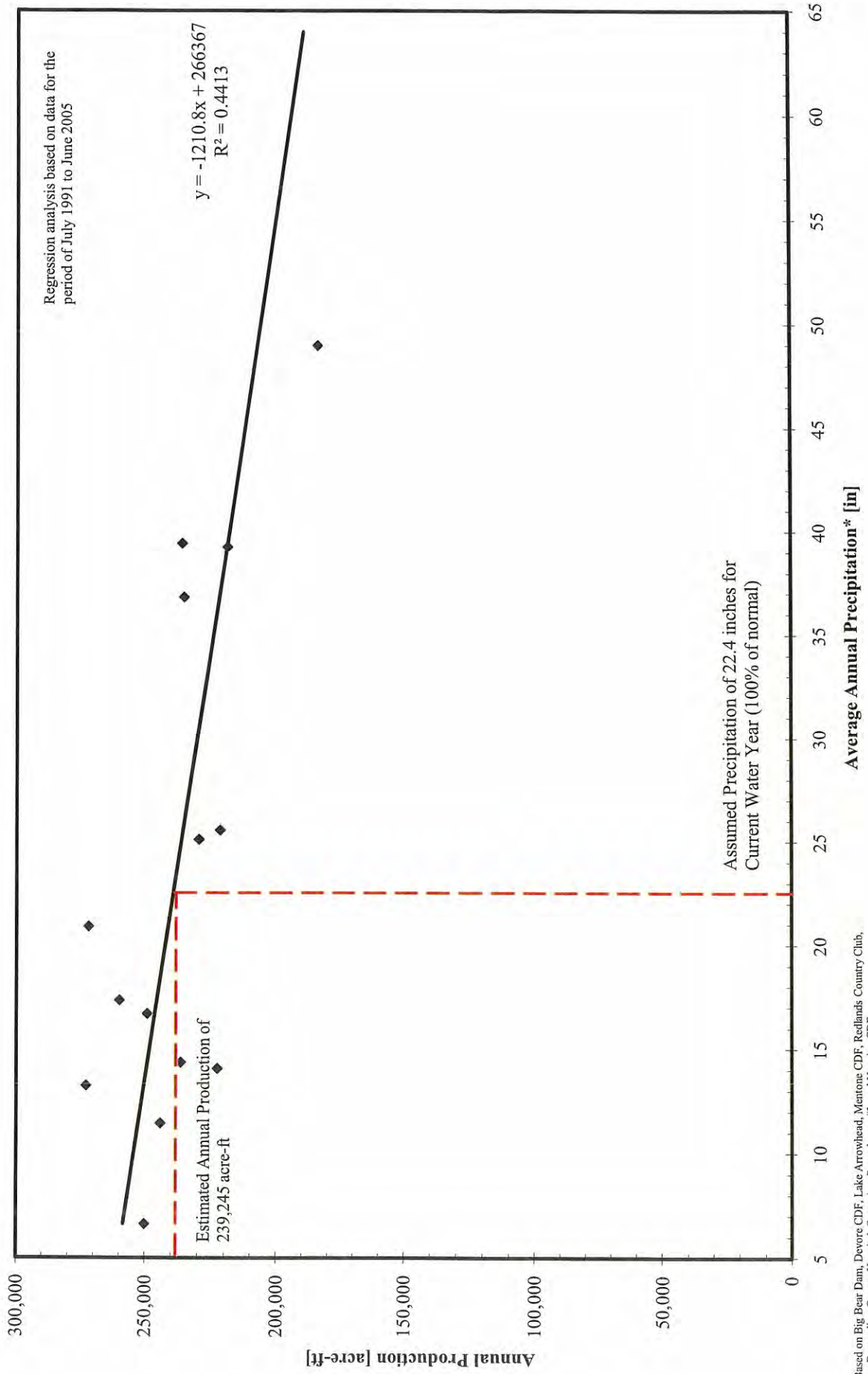
**Table 7** shows the average annual change in storage for the immediate past ten water years (July 1999 to June 2009) using the same method as described in Section 4.0. By summing the average annual change in storage for each sub-area, a total average annual change in storage for the Bunker Hill Basin for the immediate past ten water years was determined to be -33,051 acre-feet/year.

# Estimate of Production for Current Water Year (July 2008 To June 2009)



\*Based on Big Bear Dam, Devore CDF, Lake Arrowhead, Mentone CDF, Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

# Estimate of Production for Ensuing Water Year (October 2010 To September 2011)



\*Based on Big Bear Dam, Devore CDF, Lake Arrowhead, Mentone CDF, Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

# Average Annual Change in Storage for Bunker Hill Basin

Fall 1999 to Fall 2009

(The Immediate Past 10 Water Years)

Sub-area	[1] Average Change in Water Level* [ft]	[2] Area [acres]	[3] Storativity (S)	[4] Average Annual Change in Storage** [acre-ft]
Bunker Hill I - Southwest of Barstow Freeway	-2.96	11,714	0.09	-3,051
Bunker Hill I - Northeast of Barstow Freeway	-4.83	7,795	0.11	-4,143
Bunker Hill II - West of Mentone Fault	-11.36	35,206	0.06	-23,601
Bunker Hill II - East of Mentone Fault	-4.97	11,091	0.13	-7,163
Lyle Basin - Southeast of Barrier J	8.89	5,237	0.07	3,258
Lyle Basin - Northwest of Barrier J	-1.99	1,924	0.13	-497
Pressure Zone - North of Santa Ana Wash	13.30	11,920	0.02	3,170
Pressure Zone - Santa Ana Wash	-7.65	6,686	0.02	-1,023

Total = -33,051

[1] Based on average annual changes in water level within each Sub-area over last 10 years. (See Appendix E)

[2] Estimated using GIS.

[3] Based on data from Hardt and Hutchinson (1980). S storativity: The amount of water stored or released per unit area of aquifer given unit head change.

[4] = [1] x [2] x [3]

\* A positive sign denotes an increase in water level and a negative sign represents a decline in water level.

\*\* A positive sign denotes an increase in storage and a negative sign represents a decline in storage.



## 10.0 **Task 7** - Estimated Amount of Agricultural Water and Other Than Agricultural Water to be Withdrawn for the Ensuing Water Year (July 1, 2010 to June 30, 2011)

The estimated amount of agricultural water and other than agricultural water to be withdrawn within the District for the ensuing water year (July 1, 2010 to June 30, 2011) was based on the following equations:

$$Q_{agr(10-11)} = Q_{agr(08-09)} \times \left[ \frac{(Q_{total(10-11)} - Q_{surf(10-11)})}{(Q_{total(08-09)} - Q_{surf(08-09)})} \right]$$

and

$$Q_{non-agr(10-11)} = Q_{non-agr(08-09)} \times \left[ \frac{(Q_{total(10-11)} - Q_{surf(10-11)})}{(Q_{total(08-09)} - Q_{surf(08-09)})} \right]$$

where:

- $Q_{agr(10-11)}$  = Agricultural use within the District for the ensuing water year, acre-ft
- $Q_{agr(08-09)}$  = Agricultural use within the District for the preceding water year, acre-ft (Appendix C)
- $Q_{total(10-11)}$  = Production (including surface diversion) from the Bunker Hill Basin for the ensuing water year, acre-ft (Figure 13)
- $Q_{total(08-09)}$  = Production (including surface diversion) from the Bunker Hill Basin for the preceding water year, acre-ft (Appendix C)
- $Q_{non-agr(10-11)}$  = All other uses within the District for the ensuing water year, acre-ft
- $Q_{non-agr(08-09)}$  = All other uses within the District for the preceding water year, acre-ft (Appendix C)
- $Q_{surf(10-11)}$  = Surface diversions from the Bunker Hill Basin for the ensuing water year, acre-ft (Table 8)
- $Q_{surf(08-09)}$  = Surface diversions from the Bunker Hill Basin for the preceding water year, acre-ft (Appendix C)





**Calculation Values:**

$Q_{ag(08-09)} =$	<b>9,653</b>	(record)	<b>Source: Appendix C</b>
$Q_{total(10-11)} =$	<b>239,245</b>	(calc)	<b>Source: Figure 13 (Table)</b>
$Q_{total(08-09)} =$	<b>188,951</b>	(record)	<b>Source: Appendix C</b>
$Q_{nonag(08-09)} =$	<b>69,866</b>	(record)	<b>Source: Appendix C</b>
$Q_{surfdiv(10-11)} =$	<b>59,527</b>	(calc)	<b>Source: Task 8</b>
$Q_{surfdiv(08-09)} =$	<b>71,405</b>	(record)	<b>Source: Table 8</b>

Data on agricultural use and all other uses within the District for the preceding water year (July 1, 2008 to June 30, 2009) are provided in **Appendix C**. For the period July 1, 2008 through June 30, 2009, approximately 9,653 acre-feet of groundwater was produced for agricultural applications within the District boundary. For the same period, approximately 69,866 acre-feet of groundwater was produced for all other uses (non-ag) within the District boundary. Using the equations presented above with the following values inserted:

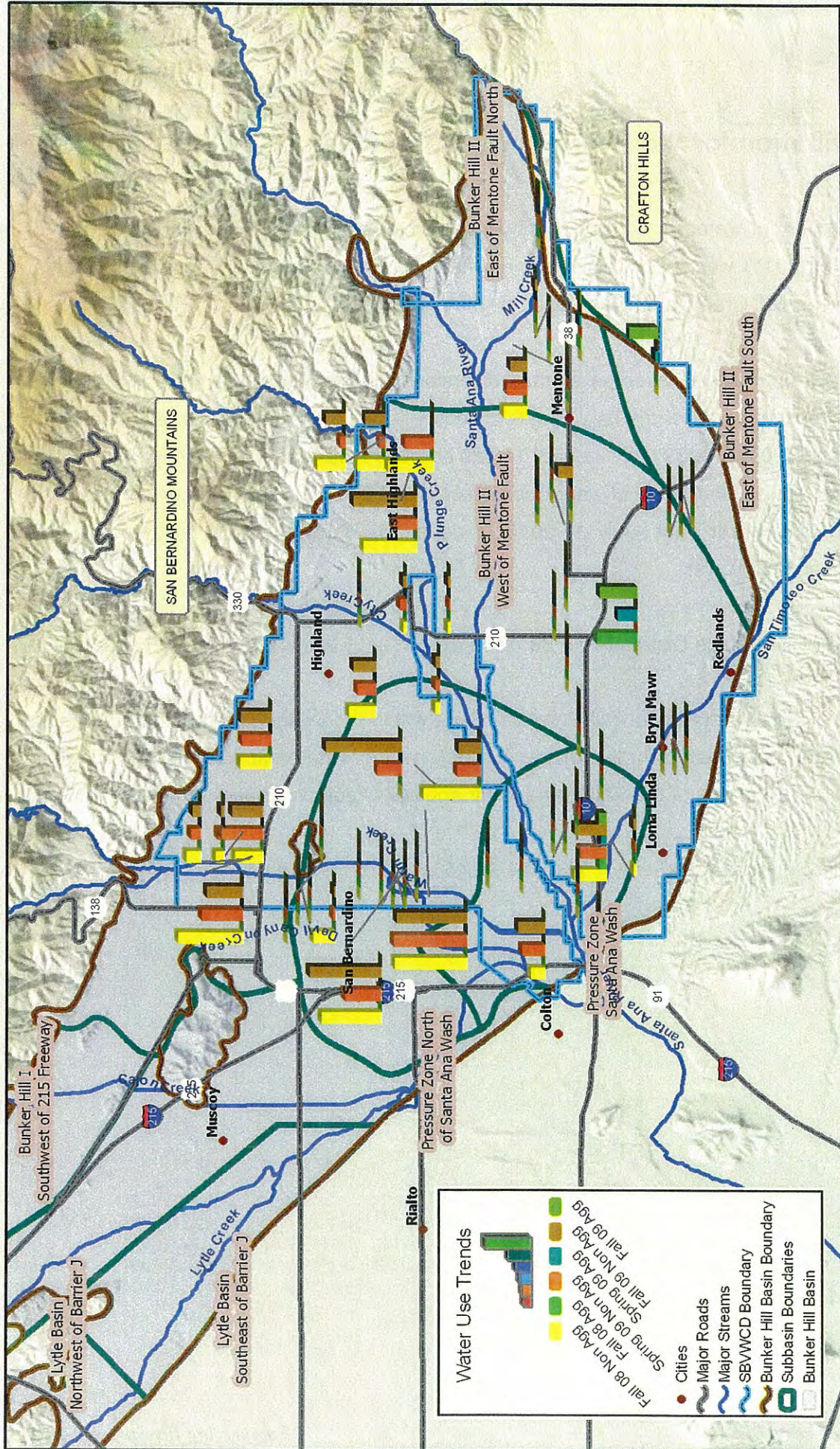
$$Q_{agr(10-11)} = (9,653) \times [(239,245 - 59,527) / (188,951 - 71,405)] = 14,808 \text{ acre-feet}$$

$$Q_{non-agr(10-11)} = (69,866) \times [(239,245 - 59,527) / (188,951 - 71,405)] = 107,179 \text{ acre-feet}$$

$Q_{ag(10-11)} =$	<b>14,808</b>
$Q_{nonag(10-11)} =$	<b>107,179</b>
$Q_{Dist(10-11)} =$	<b>121,987</b>

By summing these two results, it is estimated that 121,987 acre-feet of groundwater will be withdrawn within the District for the ensuing water year (July 1, 2010 to June 30, 2011). **Figure 14** shows the Agriculture and Non-Agriculture trends for the District by subbasin using approximately 178 wells within the District Boundary reporting type of use.





Engineering Investigation  
 March 2010

Source: SBVWCD GIS  
 L. Pierce

## District Water Production By Agriculture and Non-Agriculture Uses July 2008- December 2009 Engineering Investigation Report

State Plane  
 NAD 83, Zone V, feet  
 10M DEM DWR  
 Data Sources:  
 SBVWCD  
 178 Wells District Production summary

Miles  
 1 0.5 0 1 2





## **11.0 Task 8 - Estimated Amount of Water for Surface Distribution for the Ensuing Water Year (July 1, 2010 to June 30, 2011)**

The amount of water for surface distribution for the ensuing water year (July 1, 2010 to June 30, 2011) was estimated based on the average surface diversions for the Santa Ana River, Mill Creek, and Lytle Creek for the period 1984 to 2009.

As shown in **Table 8**, average surface diversions for the Santa Ana River, Mill Creek, Lytle Creek and smaller tributary creeks collectively called "Bunker Hill Creeks," between 1984 and 2009 were 39,074, 20,453, 11,229 and 649 acre-feet, respectively. Therefore, the total estimated amount of water for surface distribution from the Bunker Hill Basin for the ensuing water year (July 1, 2010 to June 30, 2011) is found by summing the diversions as follows:

$$\text{Bunker Hill Surface Distribution} = 39,074 + 20,453 + 11,229 + 649 = 71,405 \text{ acre-feet}$$

As Lytle Creek and Bunker Hill Creeks are not within the District, the estimated amount of surface distribution from the District for the ensuing water year (July 1, 2009 to June 30, 2010) is the sum of the Santa Ana River and Mill Creek distributions.

$$\text{District Surface Distribution} = 39,074 + 20,453 = 59,527 \text{ acre-feet}$$

# Summary of Surface Distribution Water for Bunker Hill Basin 1984 to 2009

Streamflow Diversions	1984 [acre-ft]	1985 [acre-ft]	1986 [acre-ft]	1987 [acre-ft]	1988 [acre-ft]	1989 [acre-ft]	1990 [acre-ft]	1991 [acre-ft]	1992 [acre-ft]	1993 [acre-ft]	1994 [acre-ft]	1995 [acre-ft]	1996 [acre-ft]	1997 [acre-ft]
<b>Lytle Creek</b>														
Fontana Union WC	2,445	2,743	1,798	2,725	2,591	2,245	204	1,633	12,080	7,860	13,270	10,000	10,100	NA
Mount Vernon WC	724	724	724	724	724	724	724	724	724	724	1,143	102	0	0
Rialto, City of	1,654	1,075	1,325	539	1,111	1,005	792	1,014	743	193	843	44	1,070	393
San Bernardino, City of	1,448	1,448	1,448	1,448	1,448	1,448	1,448	1,448	1,448	520	NA	2,400	2,400	0
West Valley Water District	3,696	3,340	3,686	3,686	3,696	3,696	2,554	3,701	3,696	3,696	3,697	3,696	3,686	4,079
Subtotal	9,968	9,330	8,961	9,122	9,970	9,118	5,722	8,520	19,591	13,412	16,912	16,140	17,256	4,472
<b>Mill Creek</b>														
Redlands, City of	4,617	12,932	11,676	11,178	7,731	8,285	6,794	11,109	14,559	19,886	14,505	9,786	12,250	10,250
SBVWCD Mill Creek Spreading														
Subtotal	4,617	12,932	11,676	11,178	7,731	8,285	6,794	11,109	14,559	19,886	14,505	9,786	12,250	10,250
<b>Bunker Hill Creeks</b>														
Arrowhead Water & Power West Twin Ck														
Arrowhead Water & Power East Twin Ck														
Devore Water Company Kimbark Lower Dipon														
Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Santa Ana River</b>														
Tier Valley Mutual WC	23,392	19,837	23,160	16,373	14,170	14,785	11,244	20,651	26,014	42,079	23,812	30,794	38,252	31,479
Redlands Water Co	NA	NA	1,122	961	963	800	577	NA	NA	NA	NA	NA	NA	760
SBVWCD SAR Spreading														
Subtotal	23,392	19,837	24,282	17,334	15,133	15,675	11,821	20,651	26,014	42,079	23,812	30,794	38,252	32,239
<b>Subtotal</b>	23,392	19,837	25,404	18,295	16,096	16,565	12,398	20,651	26,014	2,314	23,812	30,794	38,252	32,239
<b>Lytle Creek</b>														
Fontana Union WC	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,209	7,336	5,650.24	5,662	
Mount Vernon WC	0	0	0	0	0	0	0	0	0	0	0	0	299	
Rialto, City of	896	1,461	NA	1,305	1,143	736	1,707	1,209	1,448	1,160	1,165.00	1,134.82	1,006	
San Bernardino, City of	0	0	0	0	0	0	580	5	254	483	498	841	841	
West Valley Water District	3,696	3,408	3,047	3,175	2,573	2,380	4,710	2,079	3,081	NA	3,369	NA	3,422	
Subtotal	4,592	4,869	3,047	4,480	3,716	3,106	6,997	3,293	4,783	8,209	8,209	8,209	11,229	
<b>Mill Creek</b>														
Redlands, City of	11,224	11,051	8,852	9,496	5,867	12,541	10,168	12,574	15,469	9,607	12,332	0	10,568	
SBVWCD MC														
Subtotal	11,224	11,051	8,852	9,496	5,867	12,541	10,168	12,574	15,469	9,607	12,332	0	10,568	
<b>SBVWCD-MC-DWR</b>														
Subtotal														
<b>Bunker Hill Creeks</b>														
Arrowhead Water & Power West Twin Ck														
Arrowhead Water & Power East Twin Ck														
Devore Water Company Kimbark														
Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Santa Ana River</b>														
Bear Valley Mutual WC	36,632	30,245	29,498	26,301	23,458	12,633	11,227	12,516	17,689	11,560	13,519	7,303	21,870	
Redlands Water Co	NA	NA	NA	NA	NA	NA	NA	981	1,044	884	1,044	1,474	973	
SBVWCD SAR Spreading														
Subtotal	36,632	30,245	29,498	26,301	23,458	12,633	11,227	12,516	17,689	11,560	13,519	7,303	21,870	
<b>SBVWCD-DWR-SAR</b>														
Subtotal	36,632	30,245	29,498	26,301	23,458	12,633	11,227	12,516	17,689	11,560	13,519	7,303	21,870	

Total = 71,405

NA = Data Not Available  
Source: Calendar year totals from Western Municipal Water District  
Bunker Hill Creeks were not included in total for Diversions

**Surface Diversions, comments:**  
The amount of water for surface distribution for the incoming water year (October 1, 2009 to September 30, 2011) was estimated based on the average surface distribution for the Santa Ana River, Bunker Hill Creeks, Mill Creek, and Lytle Creek for the period of 1984 to 2009. As shown in Table B below, the average surface distribution for the Santa Ana River, Mill Creek, and Lytle Creek, including Department of Water Resources purchased water between 1984 to 2009 was 37,895, 641, 70,253, 11,229 acre-feet respectively. Assuming Department of Water Resources surface water is available for purchase by SBVWCD at an average of 1,356 acre-feet of surface water will also be available.

Average Bunker Hill Basin Spreading deliveries from summing those subtotals:  
Bunker Hill Surface Distribution for 2009 = 39,074 + 649 + 20,433 + 11,229 = 71,405 acre-feet  
Since Lytle Creek and Bunker Hill Creeks are not contained within the Water Conservation District, the average Surface Distribution for the District for the period SBVWCD Surface Distribution 1984 to 2009 was = 20,433 and 39,074 acre-ft = 71,405 acre-feet





## 12.0 **Task 9 - Estimated Amount of Water for Replenishment of the Groundwater Supplies for the Ensuing Water Year (July 1, 2010 to June 30, 2011) 397,600**

The amount of water necessary from all sources, including natural recharge, to maintain constant groundwater supplies in the Bunker Hill Basin for the ensuing water year (July 1, 2010 to June 30, 2011) is estimated as follows:

$$\text{Replenishment} = \text{Total Production} - \text{Surface Diversions} + \text{Change in Storage}$$

or,

$$Q_{\text{Replenishment (10-11)}} = Q_{\text{prod (10-11)}} - Q_{\text{surf (10-11)}} + Q_{\text{Annual } \Delta \text{ storage (10-11)}}$$

The estimated production and surface diversions from the Bunker Hill Basin for the ensuing water year (July 1, 2010 to June 30, 2011) were estimated as approximately 239,850 acre-feet (from **Figure 13**) and 71,405 acre-feet (from **Table 8**), respectively. The estimated change in storage determined in Section 8.0 and shown on **Figure 11** is a decrease of 12,638 acre-feet. Therefore, the amount of water necessary for replenishment of the groundwater supplies of the Bunker Hill Basin is estimated as follows:

$$Q_{\text{Replenishment (10-11)}} = 239,245 - 71,405 + (-) 12,638 = 181,082 \text{ acre-feet}$$

The amount of water necessary to maintain constant groundwater supplies within the District for the ensuing water year (July 1, 2010 to June 30, 2011) is estimated using the same equation as shown above, but substituting values for the District area. The estimated production within the District for the ensuing water year is estimated as approximately 121,987 acre-feet (from Task 7) and 59,527 acre-feet (from Task 8, Table 8), respectively. The change in storage for the ensuing water year for the District is estimated as a decrease of 6,319 acre-feet (assumed to be half of the Bunker Hill Basin). Therefore, the amount of water necessary for replenishment of the District's groundwater supplies for the ensuing water year (July 1, 2010 to June 30, 2011) is:



$$Q_{\text{Dist Replenishment (10-11)}} = (121,987 + 59,527) - (59,527 + (-6,319)) = 128,306 \text{ acre-feet}$$

The amount of groundwater recharge that must occur from all sources, including natural recharge, in order to bring the basin back to "full" in the ensuing water year is determined as follows:

$$Q_{\text{Replenishment}} = - Q_{\text{Accumulated } \Delta \text{ storage (93-07)}} - Q_{\text{Annual } \Delta \text{ storage (07-08)}} + Q_{\text{Replenishment (08-09)}}$$

$$Q_{\text{Replenishment}} = -(-397,600) - (-12,638) + 181,082 = 591,320 \text{ acre-feet}$$

### **13.0 General Findings**

In addition to the above findings, Section 75505 of the California Water Code requires that a finding be made as to the amount of water necessary to be replaced in the intake areas of the groundwater basins within the District to prevent the landward movement of salt water into the fresh groundwater body, or to prevent subsidence of the land within the District. Because of its location and the elevations of its water tables, the Bunker Hill Basin is not subject to salt-water intrusion and the current groundwater levels (lowest = 985 msl) will not result in any significant land subsidence.

Section 75540 of the California Water Code requires that the District Board establish a zone or zones where a groundwater charge is to be implemented. The Code specifically states that a single zone may include the entire District and in May 1993 the Board established the entire District as one zone. This determination may be amended in the future, but lacking any evidence to the contrary, in the 2009-10 year the entire District will remain as a single zone in regard to any groundwater charge.

Section 75561 of the California Water Code further requires the Engineering Investigation to include a finding related to the amount of water the District is obligated by contract to purchase. At this time the District has no contractual obligation to purchase water for the replenishment of the groundwater supplies.



## **14.0 Conclusions**

Based on the results of the 2010 Engineering Investigation, the San Bernardino Valley Water Conservation District finds that:

- Due to the imbalance between recharge and production since 1993, the Bunker Hill Basin's storage is 397,600 acre-feet below that which is considered full for purposes of this Investigation.
- During the ensuing water year (July 1, 2010 to June 30, 2011), the Bunker Hill Basin can be recharged, from all sources, with 591,320 acre-feet of water. This recharge quantity is derived by algebraically adding together the accumulated deficit as of the end of the preceding water year with the estimated quantity needed to maintain the 1993 storage level considered full.
- The District should continue to take the necessary steps to enhance its capability to conduct recharge operations, which includes construction of new, or maintenance and repair of existing, diversion facilities, canals, dikes, basins, roads, and other water recharge facilities. These improvements are required to ensure that the increasing demands on the Basin, especially during drought periods, can be met.

## **15.0 Financial Data**

The San Bernardino Valley Water Conservation District, in response to questions previously asked, regarding the relationship between income and expenses that support the groundwater assessment charge is adding to the 2009-2010 Engineering Investigation this year the following financial data to show that relationship.

The numbers shown below reflect the actual income versus expenses for fiscal year 2008 – 2009 and the budgeted numbers for fiscal year 2009 – 2010. As you can see the first column is the detail for all of the San Bernardino Valley Water Conservation District's financial activity, the second column reflects the expenses that relate to the Groundwater Assessment, and the third column represents 85 percent of expenses that relate to the Groundwater Assessment, the 15 percent of expenses taken out



are believed to be related to other District business. The 15 percent was taken out to accurately state the net loss related to the Groundwater Assessment charge.

Any change in the groundwater assessment charge will not be reflected on the District's financial reports as income until 2011 in fiscal year 2010 – 2011, as the first increment of the new charge is not billed until the beginning of each calendar year. See **Table 9** 2009-2010 Budgeted Profit and Loss.



2009-2010 Budgeted Profit and Loss

	All Detail	Income/Expenses Relating to GW	85% of GW Expenses
Ordinary Income/Expense			
Income			
4010 · Interest Income	65,000.00		
4012 · LAIF		0.00	0.00
Total 4010 · Interest Income	65,000.00	0.00	
4020 · Groundwater Charge			
4021 · Assessments - Ag	19,252.00	19,252.00	19,252.00
4023 · Assessments - Non-Ag	624,295.00	624,295.00	624,295.00
Total 4020 · Groundwater Charge	643,547.00	643,547.00	643,547.00
4030 · Mining Income			
4031 · Cemex USA Plant Site Rent	18,000.00		
4032 · Cemex Mining	48,000.00		
4034 · Redlands Aggregate 5% Royalty	36,000.00		
Total 4030 · Mining Income	102,000.00	0.00	0.00
4040 · Miscellaneous Income	500.00		
4050 · Property Tax	75,000.00		
4060 · Property Income			
4062 · Mentone Property	2,100.00		
Total 4060 · Property Income	2,100.00	0.00	0.00
4080 · Exchange Plan	40,000.00	40,000.00	40,000.00
4085 · AB 303 Grant	100,000.00		
4090 · Optimization Study Reimburse.	0.00	0.00	0.00
Total Income	1,028,147.00	683,547.00	683,547.00
Gross Profit	1,028,147.00	683,547.00	683,547.00
Expense			
5050 · Regional Programs			
5070 · Groundwater Replenishment	0.00	0.00	0.00
5080 · LAFCO Contribution	10,000.00	10,000.00	8,500.00
5081 · Wash Plan	100,000.00		
Total 5050 · Regional Programs	110,000.00	10,000.00	8,500.00
5100 · Professional Service			
5120 · Misc. Professional Services	100,000.00	100,000.00	85,000.00
5122 · Wash Plan Professional Services	125,000.00		0.00
5125 · Engineering Services	25,000.00	25,000.00	21,250.00
5130 · Aerial Photography & Surveying	26,000.00	26,000.00	22,100.00
5140 · Legislative Services	48,000.00	48,000.00	40,800.00
5145 · Environmental Services	6,500.00	6,500.00	5,525.00
5170 · Audit & Accounting	18,000.00	18,000.00	15,300.00
5175 · Legal - Wash Plan	75,000.00		0.00
5180 · Legal	125,000.00	125,000.00	106,250.00
5185 · Special Counsel	60,000.00	60,000.00	51,000.00
Total 5100 · Professional Service	608,500.00	408,500.00	347,225.00

## 2009-2010 Budgeted Profit and Loss

	All Detail	Income/Expenses Relating to GW	85% of GW Expenses
5200 · Field Operations			
5210 · Equipment Maintenance	1,500.00	1,500.00	1,275.00
5220 · Maintenance Materials/Shop/Fld	2,500.00	2,500.00	2,125.00
5230 · Field Tools	1,000.00	1,000.00	850.00
5240 · Facility Maintenance	1,500.00	1,500.00	1,275.00
5250 · Emergency Repairs	3,000.00	3,000.00	2,550.00
<b>Total 5200 · Field Operations</b>	<b>9,500.00</b>	<b>9,500.00</b>	<b>8,075.00</b>
5300 · Vehicle Operations			
5310 · Vehicle Maintenance	5,000.00	5,000.00	4,250.00
5320 · Fuel	8,500.00	8,500.00	7,225.00
<b>Total 5300 · Vehicle Operations</b>	<b>13,500.00</b>	<b>13,500.00</b>	<b>11,475.00</b>
5400 · Utilities			
5410 · Alarm Service	1,500.00	1,500.00	1,275.00
5420 · Electricity	1,000.00	1,000.00	850.00
5430 · Mobile Phone	4,000.00	4,000.00	3,400.00
5440 · Telephone	10,000.00	10,000.00	8,500.00
5450 · Natural Gas	150.00	150.00	127.50
5460 · Water	2,000.00	2,000.00	1,700.00
5470 · Internet Services	5,000.00	5,000.00	4,250.00
<b>Total 5400 · Utilities</b>	<b>23,650.00</b>	<b>23,650.00</b>	<b>20,102.50</b>
6000 · General Administration			
6001 · General Administration - Other	400.00	400.00	340.00
6002 · Website	12,000.00	12,000.00	10,200.00
6003 · Property Tax	250.00	250.00	212.50
6006 · Permits	500.00	500.00	425.00
6009 · Licenses	500.00	500.00	425.00
6010 · Surety Bond	1,800.00	1,800.00	1,530.00
6012 · Office Maintenance	500.00	500.00	425.00
6015 · Mentone House Maintenance	1,500.00		0.00
6018 · Janitorial Services	8,000.00	8,000.00	6,800.00
6019 · Janitorial Supplies	500.00	500.00	425.00
6021 · Office Equipment Maint.	1,500.00	1,500.00	1,275.00
6024 · Computer Equipment Maint.	7,500.00	7,500.00	6,375.00
6030 · Office Supplies	6,500.00	6,500.00	5,525.00
6033 · Office Equipment Rental	10,500.00	10,500.00	8,925.00
6036 · Printing	9,000.00		0.00
6039 · Postage and Overnight Delivery	1,500.00	1,500.00	1,275.00
6042 · Payroll Processing	3,000.00	3,000.00	2,550.00
6045 · Bank Service Charges	200.00	200.00	170.00
6048 · Furniture & Accessories	500.00	500.00	425.00
6051 · Uniforms	2,000.00	2,000.00	1,700.00



2009-2010 Budgeted Profit and Loss

	All Detail	Income/Expenses Relating to GW	85% of GW Expenses
6060 · Outreach			
6061 · WRI Contribution	1,000.00	1,000.00	0.00
6062 · Water Contributions	700.00	700.00	850.00
6064 · Business Expos	300.00	300.00	595.00
6065 · Wtr Cons. Gardens	1,750.00	1,750.00	255.00
Total 6060 · Outreach	3,750.00	3,750.00	1,487.50
6090 · Subscriptions/Publications	3,000.00	3,000.00	3,187.50
6091 · Public Notices	1,200.00	1,200.00	2,550.00
6093 · Memberships	18,000.00	18,000.00	1,020.00
Total 6000 · General Administration	94,100.00	83,600.00	15,300.00
6100 · Benefits			71,060.00
6110 · Vision Insurance	1,850.00	1,850.00	1,572.50
6120 · Workers' Comp. Insurance	14,000.00	14,000.00	11,900.00
6130 · Dental Insurance	7,000.00	7,000.00	5,950.00
6140 · State Unemployment Insurance	1,200.00	1,200.00	1,020.00
6150 · Medical Insurance	96,000.00	96,000.00	81,600.00
6160 · Social Security/Medicare Taxes	40,000.00	40,000.00	34,000.00
6170 · PERS Retirement	150,000.00	150,000.00	127,500.00
6190 · Life Insurance	5,000.00	5,000.00	4,250.00
Total 6100 · Benefits	315,050.00	315,050.00	267,792.50
6200 · Salaries			
6210 · Overtime	2,500.00	2,500.00	2,125.00
6230 · Regular Salaries	665,000.00	665,000.00	565,250.00
Total 6200 · Salaries	667,500.00	667,500.00	567,375.00
6300 · Insurance			
6310 · Property Insurance	2,500.00	2,500.00	2,125.00
6320 · General Liability Insurance	26,500.00	26,500.00	22,525.00
Total 6300 · Insurance	29,000.00	29,000.00	24,650.00
6400 · Board of Directors' Expenses			
6401 · Directors' Fees	87,000.00	87,000.00	73,950.00
6405 · Meeting Support Expense(food,be	3,500.00	3,500.00	2,975.00
6410 · Mileage	2,000.00	2,000.00	1,700.00
6415 · Air Fare	3,000.00	3,000.00	2,550.00
6420 · Other Travel	500.00	500.00	425.00
6425 · Meals	2,000.00	2,000.00	1,700.00
6430 · Lodging	6,000.00	6,000.00	5,100.00
6435 · Conf/Seminar Registrations	4,000.00	4,000.00	3,400.00
6440 · Election Fees	73,500.00	73,500.00	62,475.00
Total 6400 · Board of Directors' Expenses	181,500.00	181,500.00	154,275.00



2009-2010 Budgeted Profit and Loss

	All Detail	Income/Expenses Relating to GW	85% of GW Expenses
6500 · Administrative/Staff Expenses			
6505 · Mtg. Support Expense (food, bev	2,000.00	2,000.00	1,700.00
6510 · Mileage	1,500.00	1,500.00	1,275.00
6515 · Air Fare	2,500.00	2,500.00	2,125.00
6520 · Travel, Other (rental car, taxi	500.00	500.00	425.00
6525 · Meals	2,500.00	2,500.00	2,125.00
6530 · Lodging	4,000.00	4,000.00	3,400.00
6535 · Conf/Seminar Registrations	2,000.00	2,000.00	1,700.00
6540 · Training Registrations	1,000.00	1,000.00	850.00
Total 6500 · Administrative/Staff Expenses	16,000.00	16,000.00	13,600.00
Total Expense	2,068,300.00	1,757,800.00	1,494,130.00
Net Ordinary Income	-1,040,153.00	-1,074,253.00	-810,583.00
Other Income/Expense			
Other Expense			
7000 · Construction			
7010 · Materials	3,000.00	3,000.00	3,000.00
7020 · Protective Fencing	50,000.00	50,000.00	50,000.00
7030 · Concrete Structures	100,000.00	100,000.00	100,000.00
7040 · Canals & Pipelines	200,000.00	200,000.00	200,000.00
7050 · Basins	30,000.00	30,000.00	30,000.00
Total 7000 · Construction	383,000.00	383,000.00	383,000.00
7100 · Land & Buildings			
7110 · Buildings	10,000.00	0.00	0.00
Total 7100 · Land & Buildings	10,000.00	0.00	0.00
7200 · Equipment & Vehicles			
7210 · Computer Hardware	3,000.00	3,000.00	3,000.00
7220 · Computer Software	6,500.00	6,500.00	6,500.00
7240 · Office Equipment	2,000.00	2,000.00	2,000.00
7250 · New Vehicle	70,000.00	70,000.00	70,000.00
Total 7200 · Equipment & Vehicles	81,500.00	81,500.00	81,500.00
7400 · Professional Services			
7419 · Legal Water Rights	25,000.00	25,000.00	25,000.00
7438 · Engineering Services -Other	25,000.00	25,000.00	25,000.00
Total 7400 · Professional Services	50,000.00	50,000.00	50,000.00
Total Other Expense	524,500.00	514,500.00	514,500.00
Net Other Income	-524,500.00	-514,500.00	-514,500.00
	<b>-1,564,653.00</b>	<b>-1,588,753.00</b>	<b>-1,325,083.00</b>



**Appendix A**  
Water Level Elevations  
for the  
Bunker Hill Basin  
Fall 2008 –Fall 2009

Appendix A  
Water Elevations Fall 09 and Fall 08 Averages

OwnerName	Recordatio	DBKeyCasin	LocalName	StateWellIN	Fall 09 Start Elev	F09 Water Elev	F08WatElev
Bear Valley Mutual Water Company	3600023	136101	Judson 1	01S03W24C01S	1528.98	271	243
Bear Valley Mutual Water Company	3601585	246501	San Bernardino Ave 1	01S03W23A03S	1480.43	263	246
City of Colton	3601257	169601	13	01S04W08F07	1095.11	225	225
City of Colton	3601259		15	01S04W18G01S	1093.47		
City of Colton	3601260	169901	16	01S04W08F10S	1096.22	253	263
City of Colton	3601261		17	01S04W18F01S	1099.39		
City of Colton	3602405	206401	19	01S04W08C04S	1104.07	255	223
City of Colton	3602793	211201	No 21	01S04W08F16S	1093.68	262	272
City of Colton	3602881		22	01S04W27L03S	1001.87		
City of Colton	3603367		23	01S04W21K01S			
City of Colton	3603598		24	01S04W18N01			
City of Colton	3603704	269401	26	01S04W08J02S	1025	238	284
Colton, City of	3604006		27	01S04W08R			
Colton, City of	3604007		28	01S04W08F17S			
Colton, City of	3604008		29	01S04W08Q			
City of Loma Linda	3603719	258601	Mountain View No 3	01S04W24A11	1095	225	193
City of Loma Linda	3603721	258801	Mountain View No 4	01S04W24R01	1106		
City of Loma Linda	3603057	213701	Richardson Well No 1	01S04W24C02S	1077	223	180
City of Loma Linda	3603720	258701	Richardson Well No 4	01S04W24F08	1070	228	189
City of Loma Linda	3603523	227201	South Richardson St	01S04W24P04S	1079	228	190
City of Redlands	3601308	172701	Agate No 1	01S02W19K01S	1723	128	133
City of Redlands	3602792	211101	Agate No 2	01S02W19A01S	1720	182	175
City of Redlands	3602895	212101	Airport No 1	01S03W13H02S	1530	246	228
City of Redlands	3603762	271401	Airport No 2	01S03W13M01S	1469	252	239
City of Redlands	3600053	137501	Bryn Mar No 1	01S03W31A02S	1215	221	200
City of Redlands	3602654	209001	Crafton Ave	01S02W19J02S	1780	145	149
City of Redlands	3601283	170801	East Lagonia No 2	01S02W22C02S	2260		
City of Redlands	3601287	171201	East Lagonia No 3	01S02W21B02S	2091	33	31
City of Redlands	3602791	211001	East Lagonia No 4	01S02W20B01S	1831.58	129	125
City of Redlands	3600006	135601	East Lagonia No 5	01S02W19G01S	1689		
City of Redlands	3601290	171401	East Lagonia No 6	01S02W21D01S	1970	58	59
City of Redlands	3600019	136001	Gr Rees No 1	01S03W23A05S	1490	271	258
City of Redlands	3602065	197001	Lee Well	01S03W32J02S	1357	220	220
City of Redlands	3602896	212201	Madeira Well	01S02W20D01S	1770	189	185
City of Redlands	3601281	170601	Maguet No 1	01S02W21M01S	1955	21	22
City of Redlands	3601284	170901	Maguet No 2	01S02W21E01S	2016.9	49	50
City of Redlands	3600748	154301	Mentone Acres No 1	01S03W24A01S	1584	282	275
City of Redlands	3600749	154401	Mentone Acres No 2	01S03W13P01S	1520	235	222
City of Redlands	3602351	204501	Mill Creek No 0A	01S02W13A01S	2960		12
City of Redlands	3600756	154501	Mission No 1	01S03W19L01S	1130	185	186
City of Redlands	3602346	204401	New York St No 1	01S03W28K01S	1310	169	170



Appendix A  
Water Elevations Fall 09 and Fall 08 Averages

OwnerName	Recordatio	DBKeyCasin	LocalName	StateWellIN	Fall 09 Start Elev	F09 Water Elev	F08WatElev
City of Redlands	3601586	181901	Orange St	01S03W15F01S	1290	135	146
City of Redlands	3600918	159101	Redlands Heights	02S03W01D01S	1790	175	167
City of Redlands	3601291	171501	Well No 10	01S03W35G08S	1565.8	44	40
City of Redlands	3601292	171601	Well No 11	01S03W35G07S	1565.5	36	42
City of Redlands	3601294	171801	Well No 13	01S03W35G09S	1577.2	69	65
City of Redlands	3601295	171901	Well No 14	01S03W35H04S	1585.3	62	57
City of Redlands	3601296	172001	Well No 16	01S03W35H03S	1572.2	40	45
City of Redlands	3601297	172101	Well No 17	01S03W35G11S	1550	21	23
City of Redlands	3602031	196301	Well No 30A	01S03W21H06S	1314.8	199	192
City of Redlands	3602036	196601	Well No 31A	01S03W21H07S	1319	207	199
City of Redlands	3601298	172201	Well No 32	01S03W21H01S	1318.1	200	195
City of Redlands	3601299	172301	Well No 34	01S04W24K01S	1090	185	189
City of Redlands	3602032	196401	Well No 35	01S03W22A02S	1395	229	223
City of Redlands	3602082	198001	Well No 36	02S03W03K01S	1675.2	166	155
City of Redlands	3602211	201001	Well No 37	01S03W26C01S	1435	209	190
City of Redlands	3603760	271501	Well No 39	01S03W29Q02	1225	134	139
City of Redlands	3601301	172501	Well No 41	01S03W28H01S	1312		176
City of Rialto	3601263	170201	City No 1	01N05W23Q01S	1430	265	233
City of Rialto	3602080	197801	City No 2	01N05W23Q02S	1430	293	234
City of Rialto	3602848	211901	City No 3	01N05W36B01S	1300	470	462
City of Rialto	3603030	213201	City No 5	01S04W06B01S	1211	318	310
City of Rialto	3601929	193101	City No 6	01S04W06C04S	1211	254	279
City of Rialto	3603538	216701	City No.4	01S04W06H03S	1158	234	244
City of Rialto	3603538	383501	City Well 04A	01S04W06H01S	1158	234	244
City of Riverside	3601228	167101	Cooley H	01S04W11D02S	1035.3	166	
City of Riverside	3601229	167201	Cooley I	01S04W11D03S	1033.2	176.7	
City of Riverside	3601464	175101	Garner Well No 1	01S04W02P06S	1049.4		
City of Riverside	3601465	175201	Garner Well No 2	01S04W02Q00S	1053.9		
City of Riverside	3601467	175401	Garner Well No 4	01S04W02Q06S	1057.1		
City of Riverside	3601468	175601	Garner Well No 5	01S04W02P01S	1046		
City of Riverside	3603254	215101	Garner Well No 6	01S04W02Q10S	1047.98		
City of Riverside	3601462	174901	Pooler Well	01S04W01E01S	1061		
City of Riverside	3601219	166301	Raub Well No 2	01S04W23C02S	1025		
City of Riverside	3601239	168201	Raub Well No 3	01S04W14P06S	1027.1		
City of Riverside	3601238	168101	Raub Well No 4	01S04W23C03S	1022.8	163	
City of Riverside	3602484	207101	Raub Well No 5	01S04W14N09S	1016.5	166	
City of Riverside	3602778	210801	Raub Well No 6	01S04W14N01S	1015	177	
City of Riverside	3601463	175001	Stiles Well	01S04W02A03S	1072		
City of Riverside	3601471	175901	Thorne Well No 3	01S04W22G14S	994.9		
City of Riverside	3601473	176101	Thorne Well No 5	01S04W22G16S	994.3		
City of Riverside	3601474	176301	Thorne Well No 6	01S04W22G18S	995		

Appendix A  
Water Elevations Fall 09 and Fall 08 Averages

OwnerName	Recordatio	DBKeyCasin	LocalName	StateWellIN	Fall 09 Start Elev	F09 Water Elev	F08WatElev
City of Riverside	3601475	176401	Thorne Well No 7	01S04W22G17S	994.4		
City of Riverside	3601478	176701	Thorne Well No 10	01S04W22B03S	1002		101.16
City of Riverside	3601479	176801	Thorne Well No 11	01S04W22B05S	996.9		
City of Riverside	3601476	176501	Thorne Well No 8	01S04W22G08S	995.6		
City of Riverside	3601240	168301	Warren Well No 1	01S04W22H04S	998.6		
City of Riverside	3601231	167401	Warren Well No 2	01S04W22H04S	1004.75		
City of Riverside	3601230	167301	Warren Well No 3	01S04W22H03S	998		
City of Riverside	3601243	168601	Warren Well No 4	01S04W22H02S	1005.3		
City of Riverside-Gage Canal	3602423	206701	Domestic No 6	01S04W13P01	1067.7	176	163.8
City of Riverside-Gage Canal	3600787	155401	Gage Well 26-1	01S04W23A02S	1045.33	152	158
City of Riverside-Gage Canal	3600788	155501	Gage Well 27-1	01S04W23H01S	1044.64	154	147
City of Riverside-Gage Canal	3600789	155601	Gage Well 27-2	01S04W23K01S	1044.64	155.5	142.6
City of Riverside-Gage Canal	3600790	155701	Gage Well 29-1	01S04W23K02S	1044.43	152	139.2
City of Riverside-Gage Canal	3600791	155801	Gage Well 29-2	01S04W13N01S	1046.31	155	143.2
City of Riverside-Gage Canal	3600792	155901	Gage Well 29-3	01S04W13N02S	1048.75	175	149
City of Riverside-Gage Canal	3600793	156001	Gage Well 30-1	01S04W13M02S	1054.17	164	151.1
City of Riverside-Gage Canal	3600794	156101	Gage Well 31-1	01S04W13F02S	1054.64	152.5	163.3
City of Riverside-Gage Canal	3600796	156301	Gage Well 51-1	01S04W23A05S	1044.64	169	159.3
City of Riverside-Gage Canal	3600797	156401	Gage Well 56-1	01S04W13G	1065.5	201.8	180.2
City of Riverside-Gage Canal	3602331	204001	Gage Well 66-1	01S04W23G03S	1044.85		172
City of Riverside-Gage Canal	3603558	102801	Gage Well 92-1	01S04W13N07S	1047.78	192.3	204.3
City of Riverside-Gage Canal	3603557	102901	Gage Well 92-2	01S04W13L07S	1053.38	255	172
City of Riverside-Gage Canal	3603556	103001	Gage Well 92-3	01S04W13L08S	1058.78	233	168.3
City of San Bernardino	3600726	152601	16th St and Sierra Way	01N04W34G03S	1135.13	265.3	266.4
City of San Bernardino	3600717	151701	19th St No 1	01N04W32D03S	1231.03		
City of San Bernardino	3600718	151801	19th St No 2	01N04W32D04S	1236.34	305.4	293.1
City of San Bernardino	3602264	202601	23rd St and E St	01N04W27N01S	1174.75		
City of San Bernardino	3600720	152001	27th St and Acacia St	01N04W27M02S	1184.07	304.8	302.8
City of San Bernardino	3600719	151901	30th and Mt View	01N04W27G01S	1227.38	341.9	348.7
City of San Bernardino	3602081	197901	31st and Mt View	01N04W27B01S	1233.01	348.8	346
City of San Bernardino	3603472	215601	40th St	01N04W14P01S	1355	307	320
City of San Bernardino	3602265	202701	7th St	01S04W03J05S	1057.39	201.6	177.7
City of San Bernardino	3600731	153101	Antill Well No 5	01S04W02K02S	1058.96		
City of San Bernardino	3602422	206601	Antill Well No 6	01S04W02K08S	1053.84	198.5	177.5
City of San Bernardino	3602400	206201	Baseline and California	01N04W32N01S	1185.56	268.9	256
City of San Bernardino	3602426	206801	C.C. Div	02N05W19K01	2314.32	85	76.2
City of San Bernardino	3600710	151001	Cajon Canyon	02N05W19K02S	2331.92	74.8	74.1
City of San Bernardino	3602821	211501	Cajon No. 3 and State Well	01N05W03A02S	1894	192	178.7
City of San Bernardino	3601843	190901	Cajon Well No 1	01N05W03H01S	1889.42		
City of San Bernardino	3601844	191001	Cajon Well No 2	01N05W03H02S	1897.17	197.4	189
City of San Bernardino	3600712	151201	Devil Canyon Well No 1	01N04W08N01S	1530	162.5	157.2

Appendix A

Water Elevations Fall 09 and Fall 08 Averages

OwnerName	Recordatio	DBKeyCasin	LocalName	StateWellIn	Fall 09 Start Elev	F09 Water Elev	F08WatElev
City of San Bernardino	3600711	151101	Devil Canyon Well No 2	01N04W07F01S	1621.96	164.5	154.7
City of San Bernardino	3602206	200801	Devil Canyon Well No 3	01N04W06H02S	1888.46	27.8	28.3
City of San Bernardino	3602205	200701	Devil Canyon Well No 4	01N04W06H01S	1903.44	41.7	41.4
City of San Bernardino	3602844	211701	Devil Canyon Well No 5	01N04W07J02S	1549	161.5	162.1
City of San Bernardino	3603580	108501	Devil Canyon Well No 6	01N04W06A01	2042	22.6	19.5
City of San Bernardino	3603579	108601	Devil Canyon Well No 7	01N04W06A02	2037	18.1	19
City of San Bernardino	3603688	241901	EPA Well No 1	01S04W03D04S	1093.9	275.5	221
City of San Bernardino	3603689	242001	EPA Well No 2	01S04W03C03S	1091.7	252.5	233.4
City of San Bernardino	3603690	242101	EPA Well No 3	01S04W03C04S	1090.22	281.5	266.6
City of San Bernardino	3603691	242201	EPA Well No 4	01S04W03803S	1086.27	247	225.8
City of San Bernardino	3603692	242301	EPA Well No 5	01S04W03A04S	1083.27	244.9	222
City of San Bernardino	3603693	242401	EPA Well No 6	01N04W16M03S	1396.55	168.9	189.3
City of San Bernardino	3603694	242501	EPA Well No 7	01N04W16M04S	1404.54	171.5	189.3
City of San Bernardino	3600729	152901	Gilbert Street	01N04W35M03S	1123.54	256.1	241.5
City of San Bernardino	3603471	215501	Kenwood	02N05W19R01	2350.8	127.1	110.5
City of San Bernardino	3602401	206301	Leroy Well	01N04W27A01	1239.67	342.3	348.4
City of San Bernardino	3600727	152701	Lynwood Well	01N04W26E02S	1236.23	323.4	333.8
City of San Bernardino	3603027	213101	Lyle Creek Well No 2	01N05W36J01S	1252.25	443.7	432.5
City of San Bernardino	3600713	151301	Lyle Creek Well Terrace	01N05W36R01S	1247.82		
City of San Bernardino	3601845	191101	Mallory No 3	01N04W30M01	1319.84	320.1	323
City of San Bernardino	3600737	153701	Mill and D	01N04W16N06S	1001.07	89.5	85
City of San Bernardino	3600319	142501	Mt Vernon Well	01N04W31A01S	1258.75	319.2	301.9
City of San Bernardino	3600714	151401	Newmark No 1	01N04W10N06S	1412.99	180.5	178
City of San Bernardino	3600715	151501	Newmark No 2	01N04W16E02S	1405.26	174.8	176.3
City of San Bernardino	3600716	151601	Newmark No 3	01N04W16E03S	1407.92	187.3	182.8
City of San Bernardino	3602399	206101	Newmark No 4	01N04W16E04S	1413.57	177.8	179
City of San Bernardino	3600721	152101	North E St	01N04W27M01S	1192.1	301	300
City of San Bernardino	3601117	164901	Perris Hill No 4	01N04W35C03S	1168.25	285	293
City of San Bernardino	3601115	164701	Perris Hill No 5	01N04W26P03S	1173.46	284.7	291.4
City of San Bernardino	3600728	152801	Waterman Ave	01N04W27A01S	1244.77	346.2	349.9
Crafton Water Company	3602186	200401	2	01S02W21L02S	2009.78	47	43
Crafton Water Company	3600272	141201	5th Ave 1	01S02W29N02	1859.81	312	311
Devore Water Company	3602383	205201	2	02N05W28C02S	2475	73	57.8
Devore Water Company	3602384	205301	3	02N05W28C01	2466	65.2	48.1
Devore Water Company	3602428	206901	No 4	02N05W33H01	2020	164.2	157.8
East Valley Water District	3601184	166001	Plant No 94	01N03W33F01S	1413.17	390	384
East Valley Water District	3600026	136401	Plant No 102	01S03W04J01S	1242.47	230.2	225.2
East Valley Water District	3602370	204901	Plant No 107	01N04W25F04S	1217.29	318.2	289.5
East Valley Water District	3602563	208501	Plant No 11A	01S04W02Q09S	1056.89		
East Valley Water District	3601663	185401	Plant No 12	01S04W02Q04S	1058.88	192	172.1
East Valley Water District	3600680	150601	Plant No 120 NF 3	01S03W02J02	1410	176	164.2



Appendix A  
Water Elevations Fall 09 and Fall 08 Averages

OwnerName	Recordatio	DBKeyCasin	LocalName	StateWellIN	Fall 09 Start Elev	F09 Water Elev	F08WatElev
East Valley Water District	3602799	211301	Plant No 125	01S02W07F01S	1600	248.5	243.2
East Valley Water District	3602034	196501	Plant No 12A	01S04W02Q08S	1057	199	181
East Valley Water District	3600376	143001	Plant No 132 Cull No 2	01S03W05D03S	1155	220.5	215.3
East Valley Water District	3601987	194301	Plant No 136 Dunkirk No 1	01S03W04G02S	1245.85	261.2	254.3
East Valley Water District	3602560	208401	Plant No 136 Dunkirk No 2	01S03W04G03S	1240	260.8	253
East Valley Water District	3601665	185601	Plant No 14	01S04W01K04S	1092.8		
East Valley Water District	3603247	215001	Plant No 141	01S03W06P18S	1117	209.5	211.1
East Valley Water District	3600220	140101	Plant No 142	01S03W01H01S	1520	282.9	241.3
East Valley Water District	3600220	106901	Plant No 142	01S03W01H01S	1520	282.9	241.3
East Valley Water District	3603583	113101	Plant No 143	01S03W02N02S	1339	188.9	171.6
East Valley Water District	3601639	183301	Plant No 146	01S03W03R02S	1327.26	351	257.6
East Valley Water District	3603734	313401	Plant No 147	01S03W02P06S	1362	503	150.3
East Valley Water District	3601671	186201	Plant No 24A	01N04W26A02S	1242.99	348.1	331.9
East Valley Water District	3602337	204101	Plant No 24B	01N04W36A03S	1244.58	382.1	326
East Valley Water District	3601673	186401	Plant No 25A	01N04W25C02S	1246.39	314	318.4
East Valley Water District	3601675	186501	Plant No 27	01N04W25A01S	1295.6	258.6	234
East Valley Water District	3602564	208601	Plant No 28A	01S04W12B06S	1090.1	209.9	171
East Valley Water District	3602274	203101	Plant No 39	01N03W30J05S	1350.29	373.7	375.7
East Valley Water District	3601978	194101	Plant No 40	01S03W04N02	1195.09	213.6	210
East Valley Water District	3602338	204201	Plant No 40A	01S03W04N03S	1196.64	223	217.6
East Valley Water District	3602113	198401	Plant No 41	01N03W30N01S	1232.29	305.6	299
East Valley Water District	3600855	157501	Plant No 54	01N03W28P01S	1520	484.8	474.9
East Valley Water District	3601660	185101	Plant No 9A	01S03W06H04S	1151.54	216.6	201.6
Fontana Union Water Company	3600562	146601	# 3 (F28A)	01N05W22F02S	1583.2	343.75	325
Fontana Union Water Company	3600563	146701	# 4 (F29A)	01N05W22C02S	1591.26	379.25	324
Fontana Union Water Company	3600585	147501	#32 (F32A)	01N05W16K01S	1722.9	338.25	301
Fontana Union Water Company	3600569	146801	(F36A)	01N05W22A01S	1549.8	381.5	319
Fontana Union Water Company	3600579	147101	#24 (F40A)	01N05W22F03S	1567	226.75	206
Fontana Union Water Company	3600581	147301	#26 (F42A)	01N05W07H01S	2066	113.25	115
Fontana Union Water Company	3600580	147201	#25 (F41A)	01N05W22F01S	1597.5	231.50	218
Fontana Union Water Company	3600582	147401	#27 (F27A)	01N05W06G01S	2244	78.00	75
Fontana Union Water Company	3600586	147601	#33 (F33A)	01N05W06K02S	2155	100.00	103
Fontana Union Water Company	3602727	209901	# 8 (F34A)	01N05W15Q02S	1590.79	401.25	374
Happe Mutual Well Company	3600238	140501	1	01S02W29M01S	1851.8		239.73
Loma Linda University	3602781	210901	Anderson II	01S04W25D06S	1075		
Loma Linda University	3602855	227101	Anderson III	01S04W25D07S	1070		
Redlands Unified School	3601641	183501	Opal St	01S02W30C01S	1649		
Riverside Highland Water Co	3601535	180401	LC No 1	01N04W31E01S	1269.22		436
Riverside Highland Water Co	3603470	215401	LC No 10	01N04W31E03S	1266		432
Riverside Highland Water Co	3602840	211601	LC No 8	01N04W31F02S	1258		
Riverside Jointly UC Regents	3602771	210501	Hunt Well No 6	01S04W27A11S	1015.5		

Appendix A  
Water Elevations Fall 09 and Fall 08 Averages

OwnerName	Recordatio	DBKeyCasin	LocalName	StateWellIN	Fall 09 Start Elv	F09 Water Elev	F08WatElv
Riverside Jointly UC Regents	3602772	210601	Hunt Well No 10	01S04W27A09S	1017.7	148	
Riverside Jointly UC Regents	3602773	210701	Hunt Well No 11	01S04W27A10S	1015.7		
San Bernardino Valley Municipal Water	3603116	102701	San Bernardino Ave No 1	01S03W13E01S	1572.5	221	207
West Valley Water District	3601848	191201	Well No 15	01S04W05E05S	1170	240	232
West Valley Water District	3601944	193601	Well No 2	01N05W23Q01S	1430	254	166
West Valley Water District	3600997	161201	Well No 7	01N05W36H04S	1273.8		

Elevation Levels were averaged from Monthly reported values in most cases.



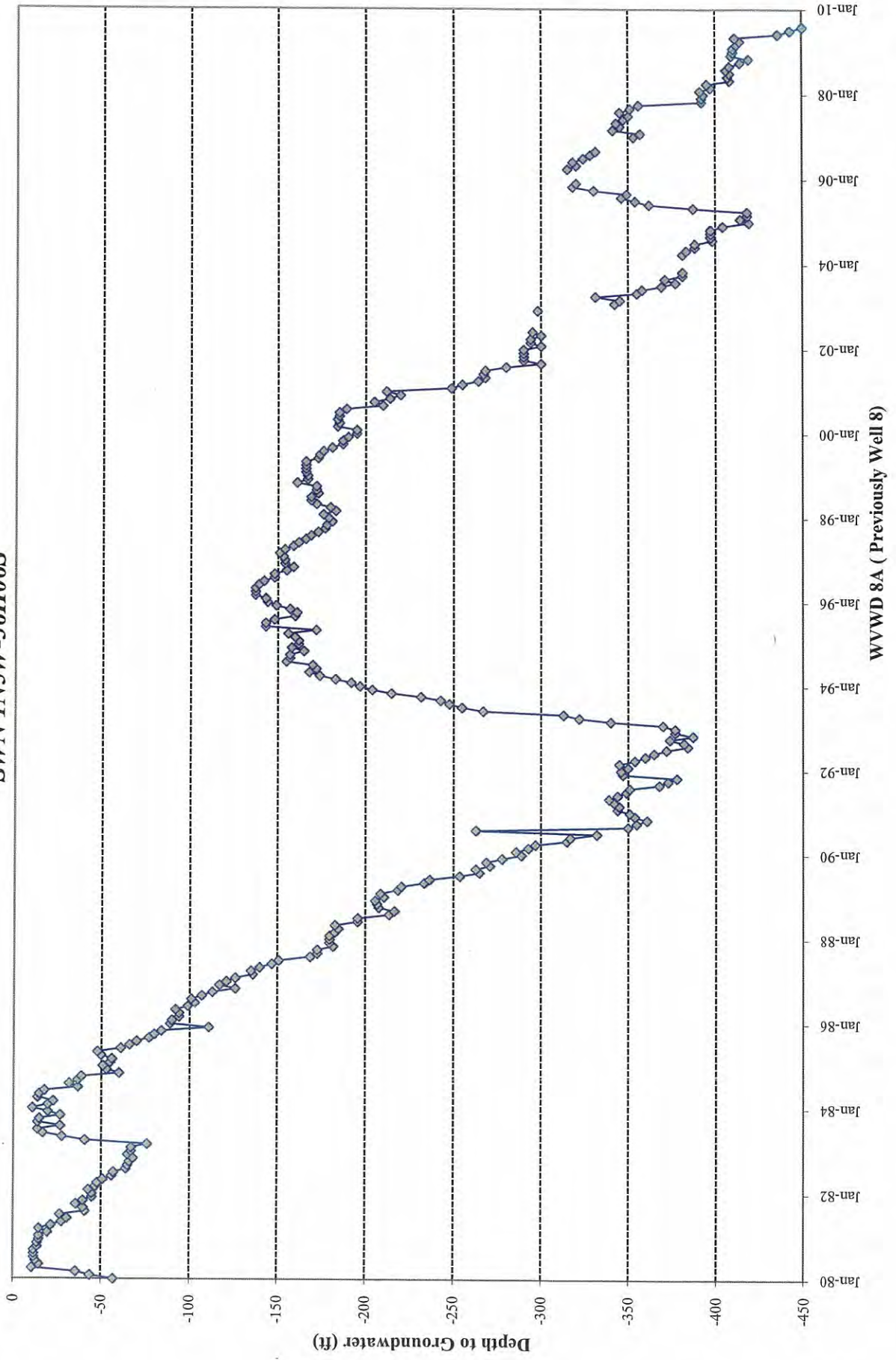
**Appendix B**  
Hydrographs  
for  
Key Wells



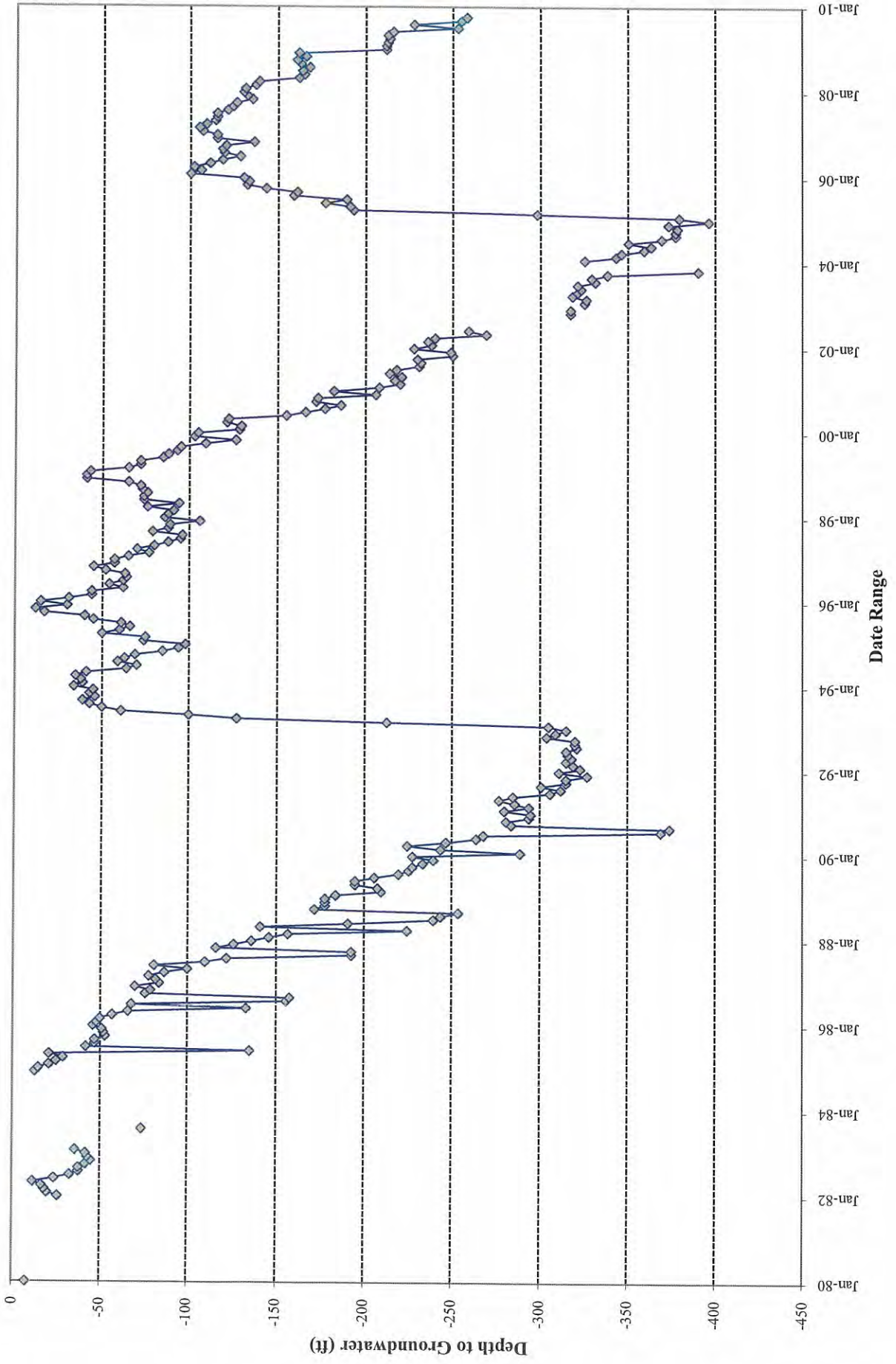
# West Valley Water District

## Well 8A (8)

*SWN 1N5W-36H06S*



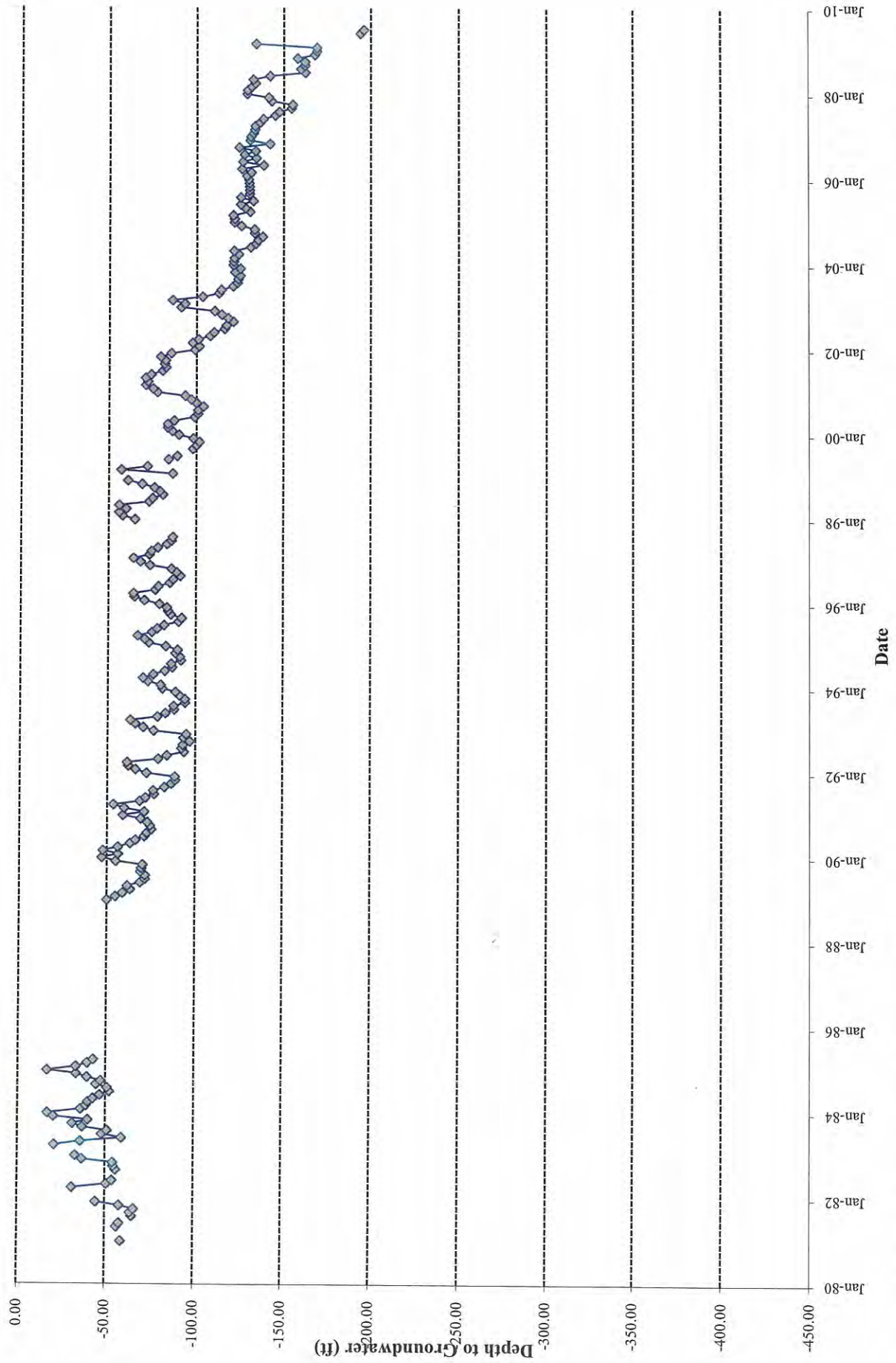
**West Valley Water District**  
**Well 2**  
*SWN 1N5W-23Q001S*



# City of Riverside - Gage Canal

## Well 26-1

SWN 1S4W-23A02S

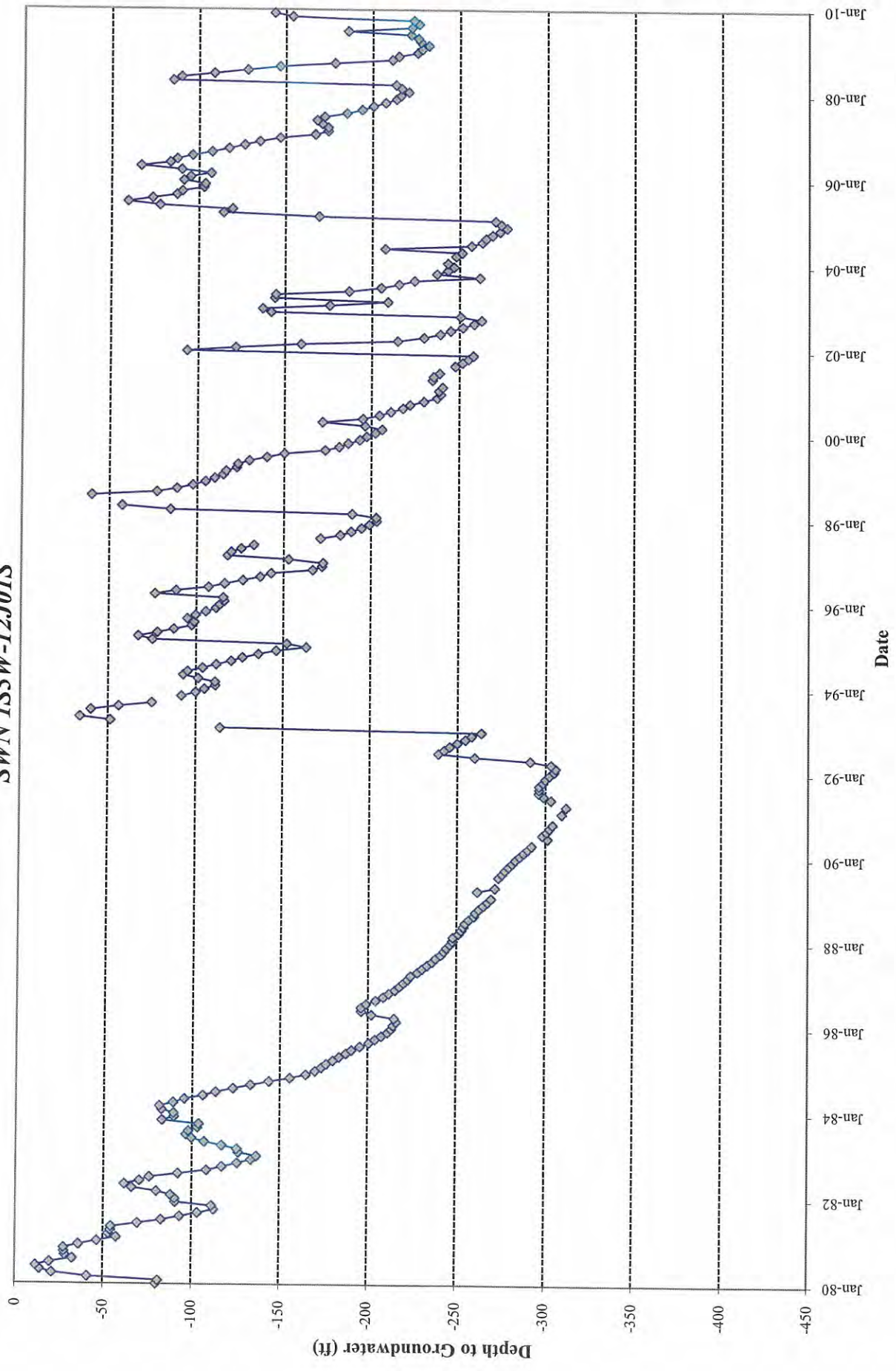




# San Bernardino Valley Water Conservation District

## 12J01

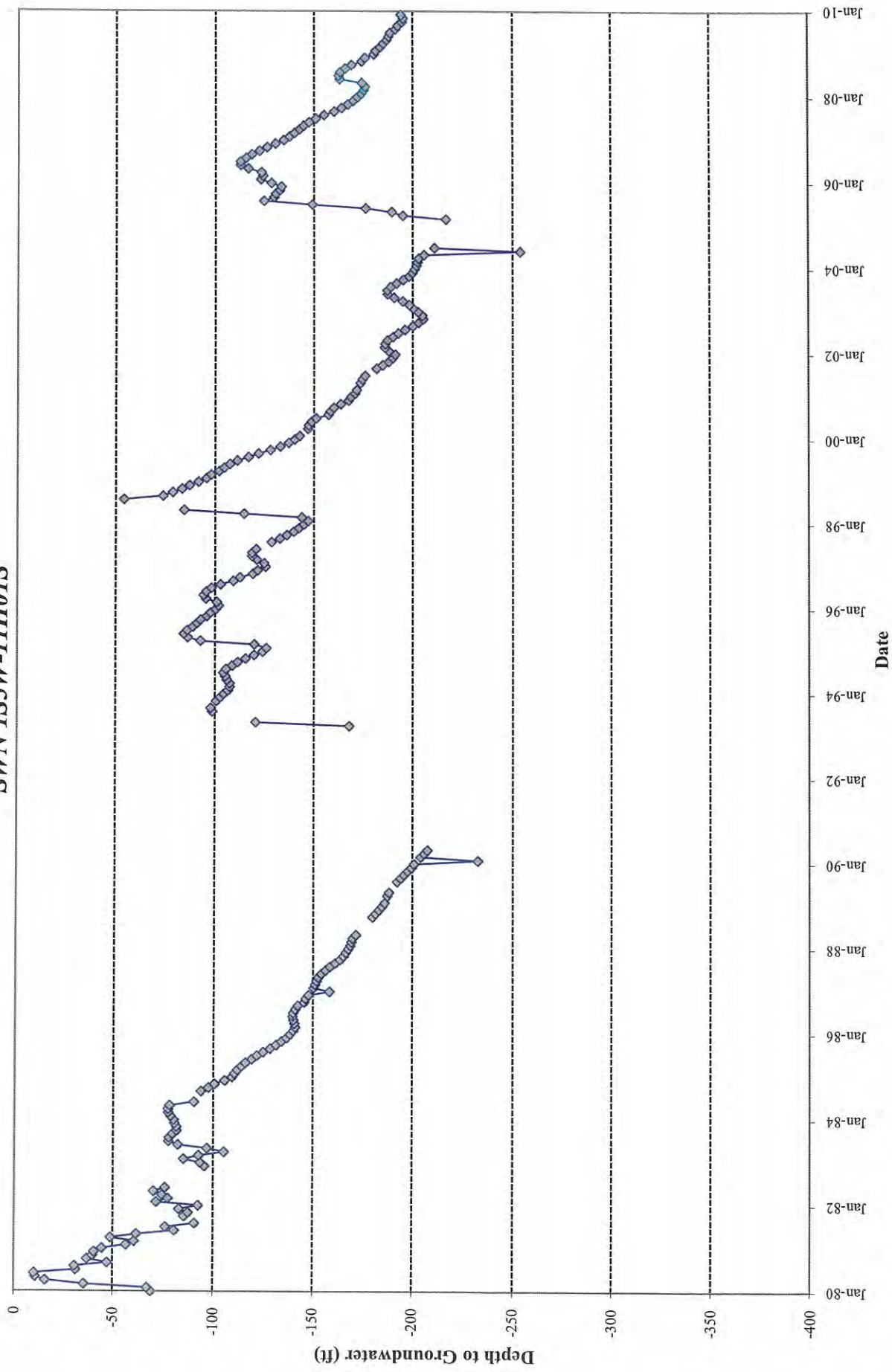
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# San Bernardino Valley Water Conservation District

## 11H01

### SWN IS3W-11H01S

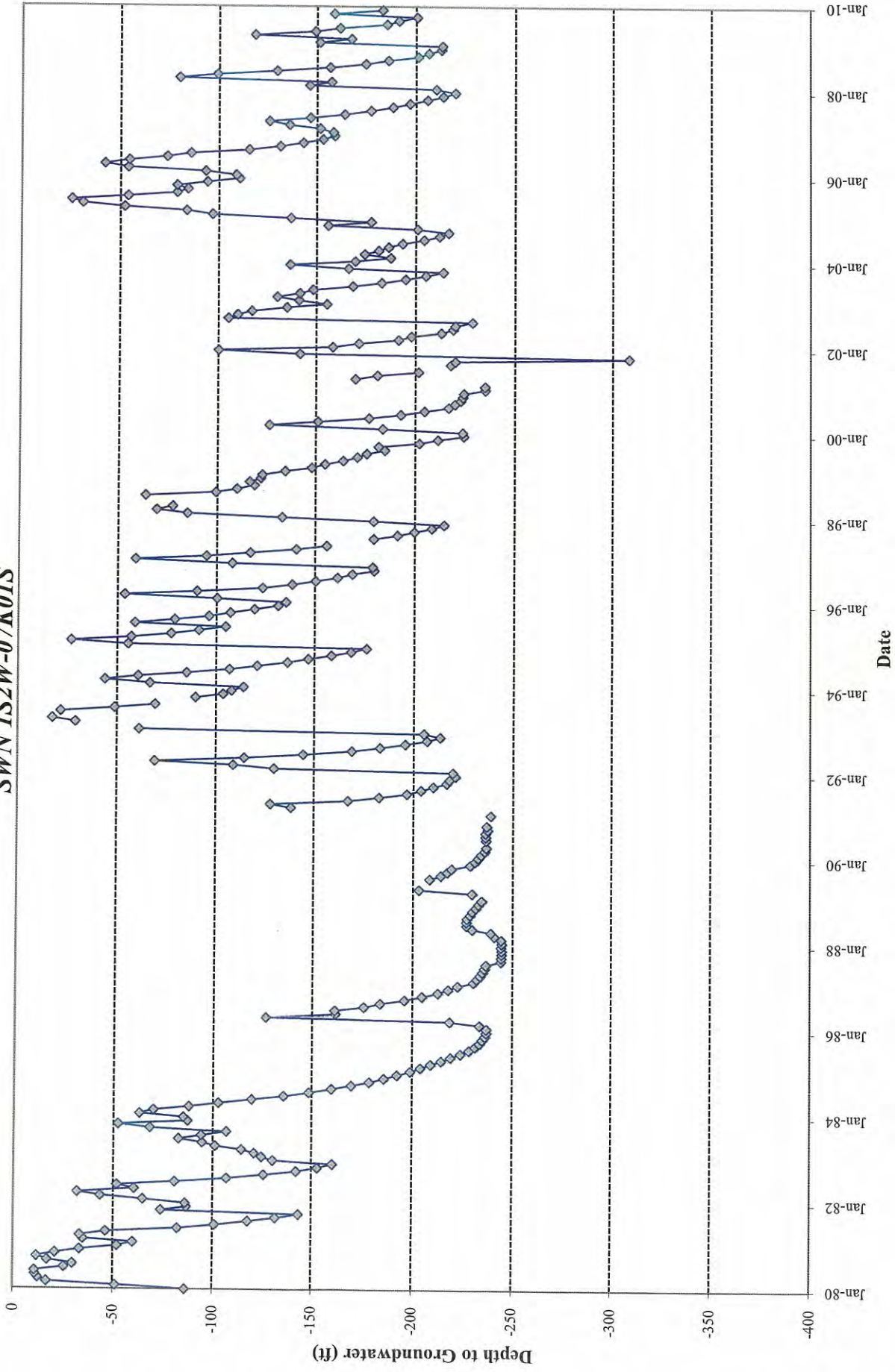




# San Bernardino Valley Water Conservation District

## 7K01

*SWN IS2W-07K01S*

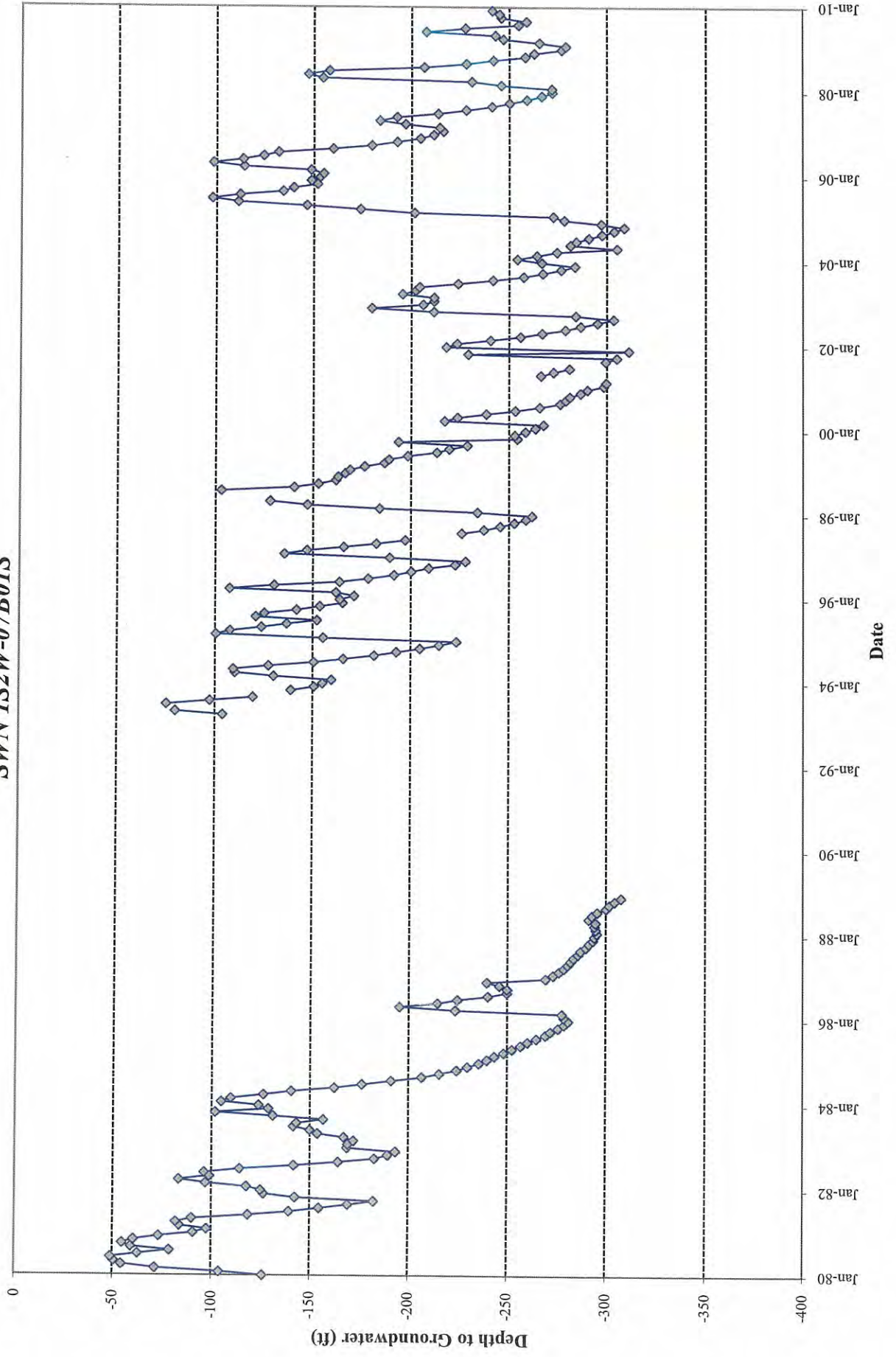




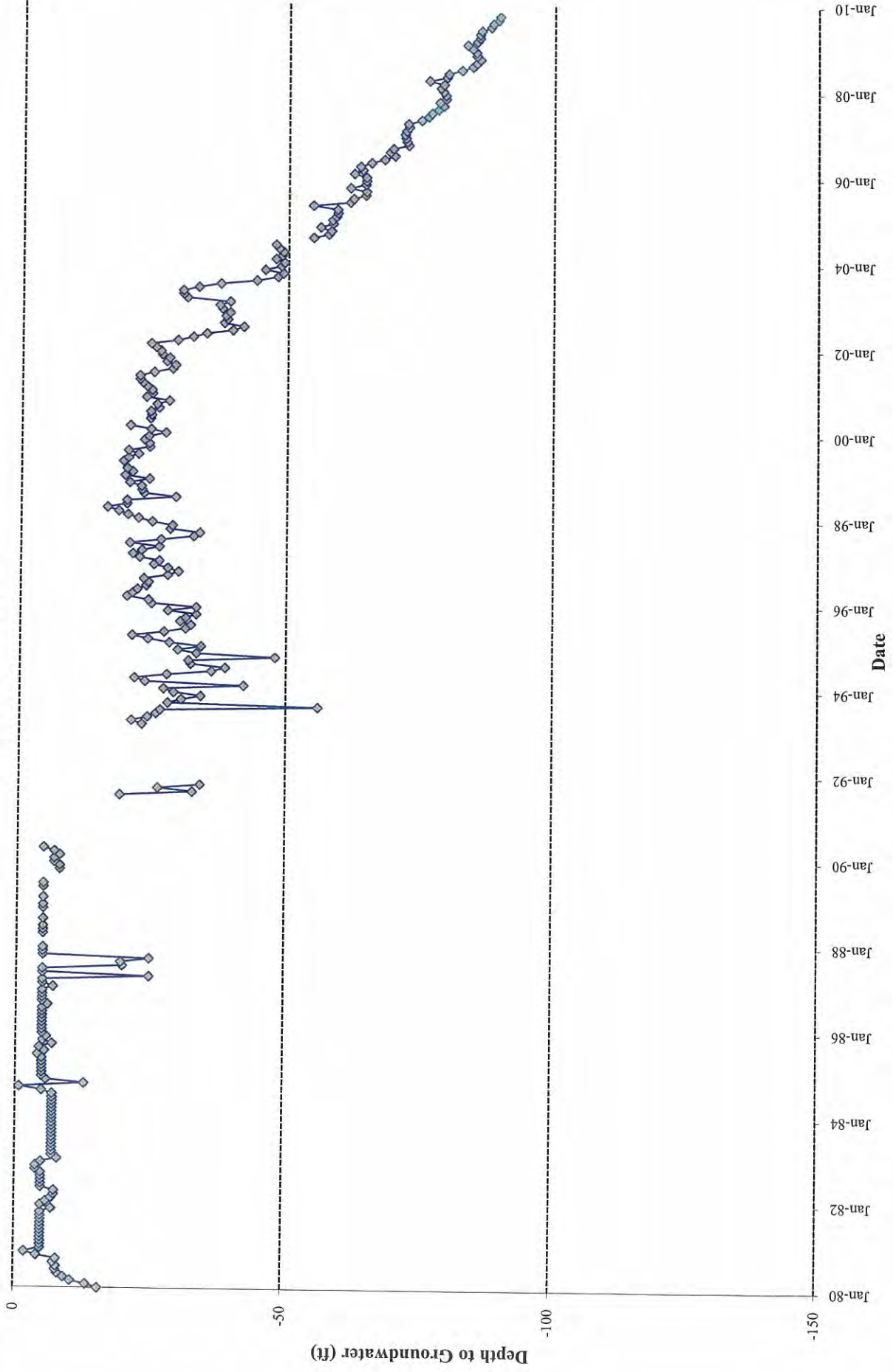
# San Bernardino Valley Water Conservation District

## 7B01

*SWN 1S2W-07B01S*



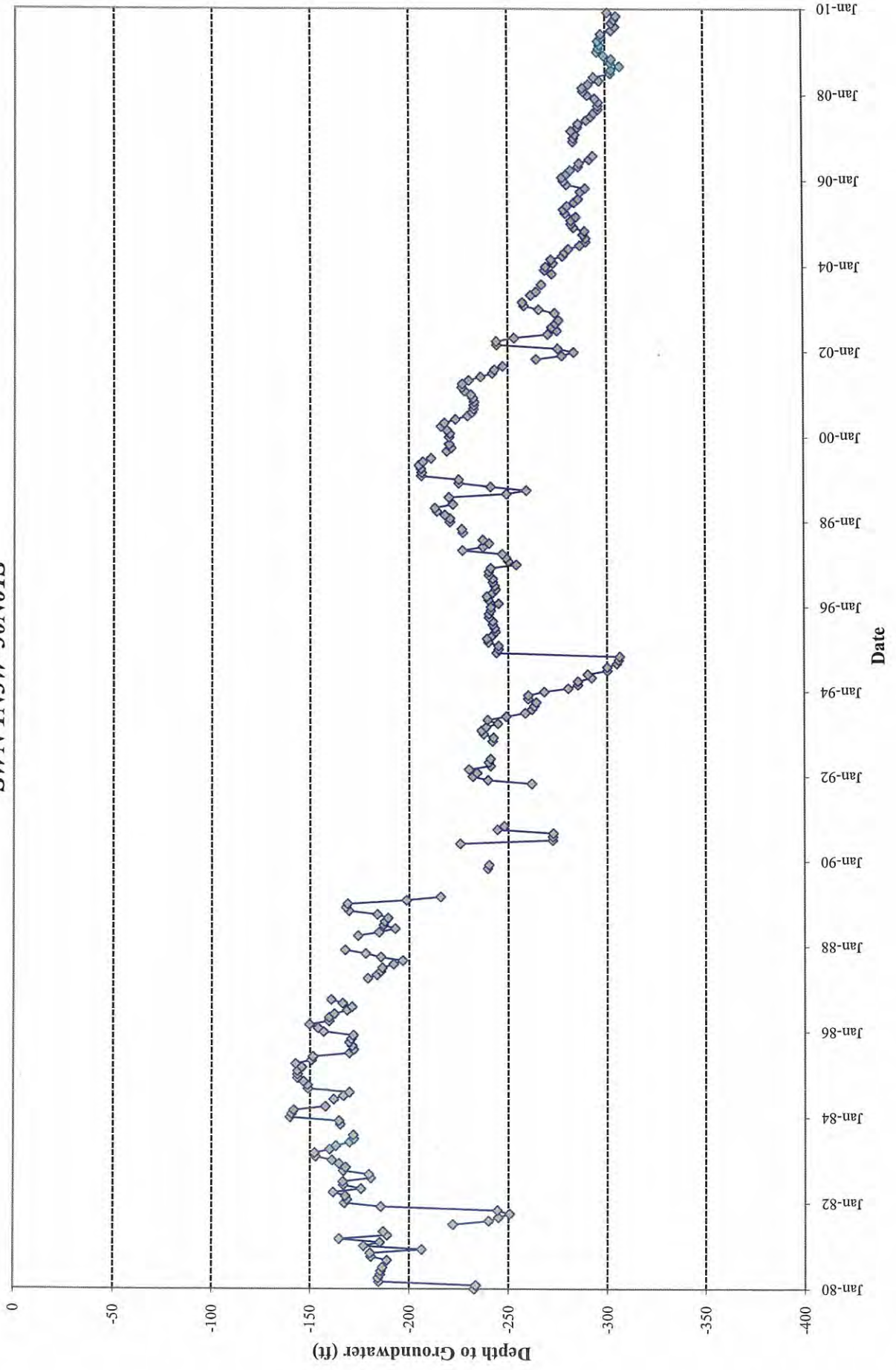
**City of San Bernardino  
Mill & D  
SWN 1S4W-10N06S**



# East Valley Water District

## Well 41

*SWN 1N3W-30N01S*

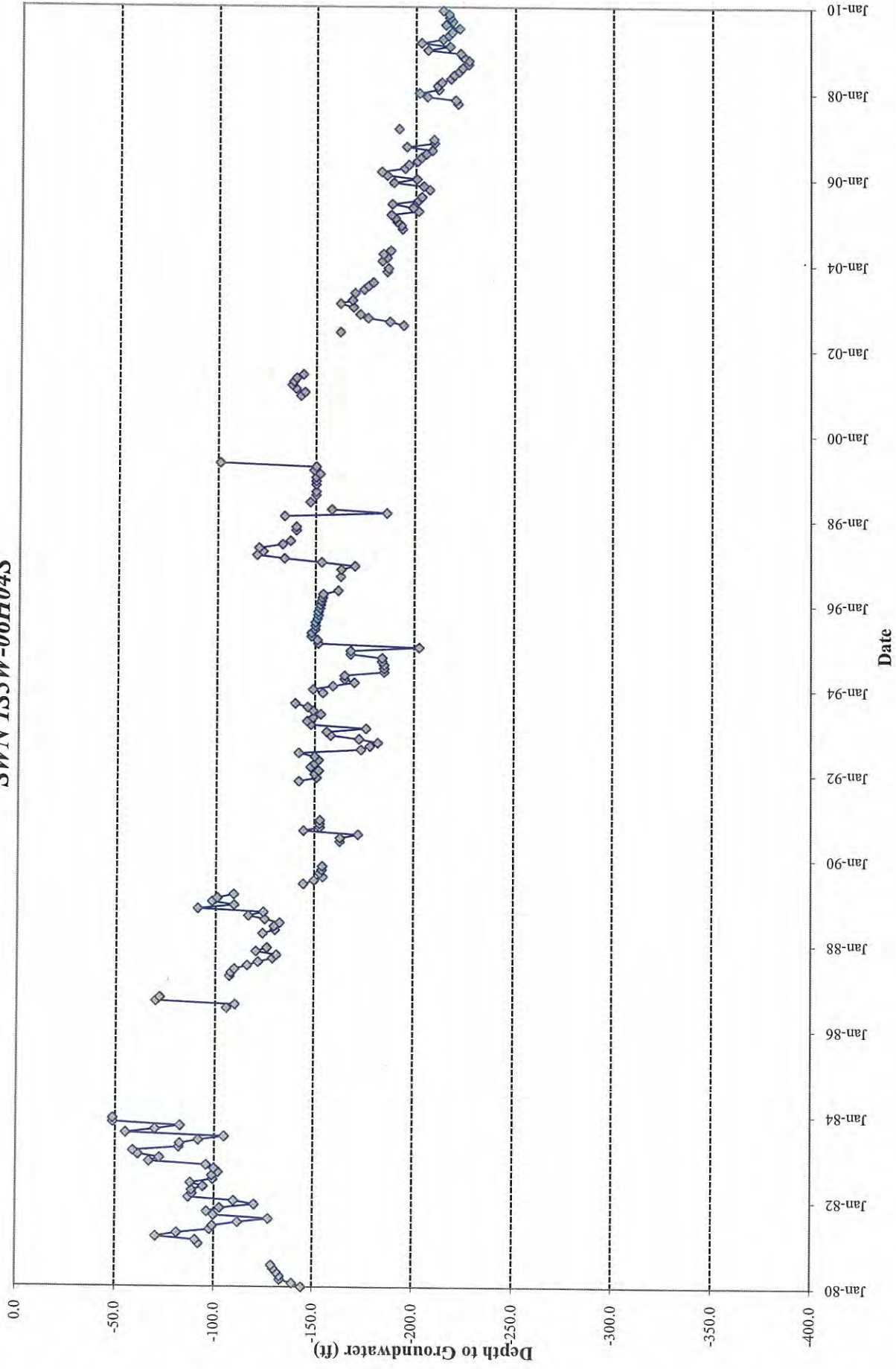




# East Valley Water District

## Well 9A

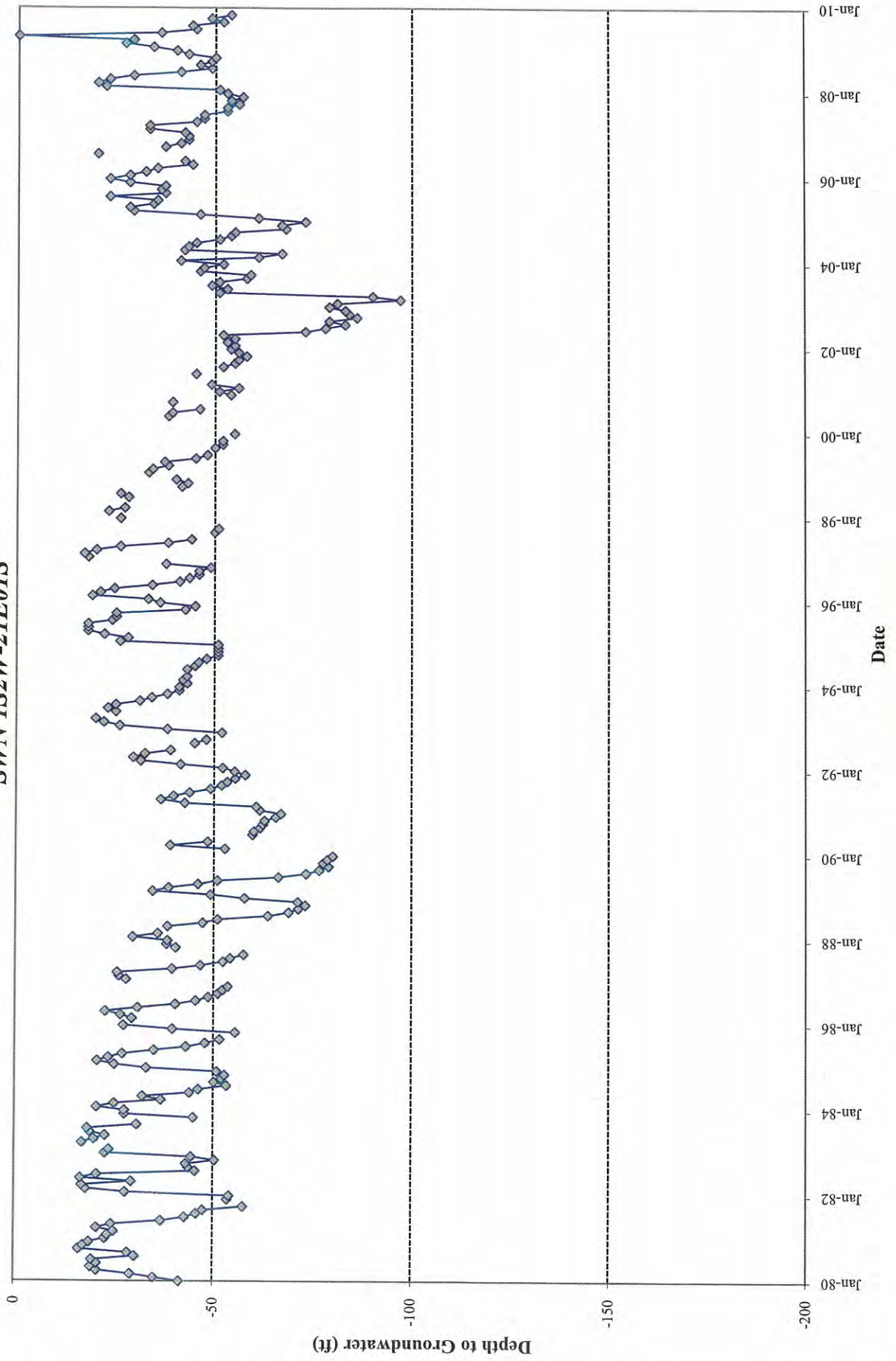
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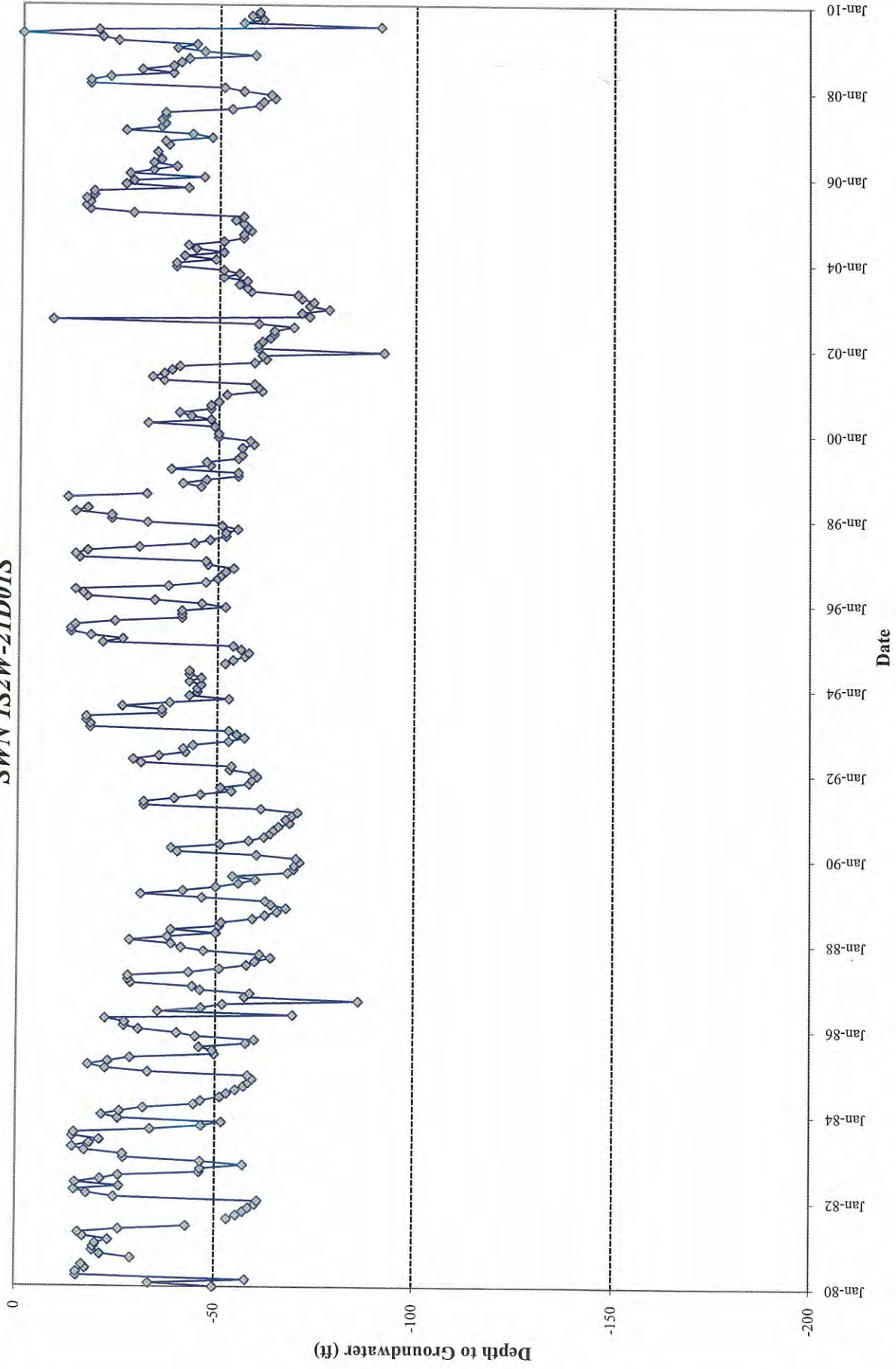
# City of Redlands

## Maguet 2

SWN 1S2W-21E01S



**City of Redlands  
East Lugonia 6  
SWN IS2W-21D01S**

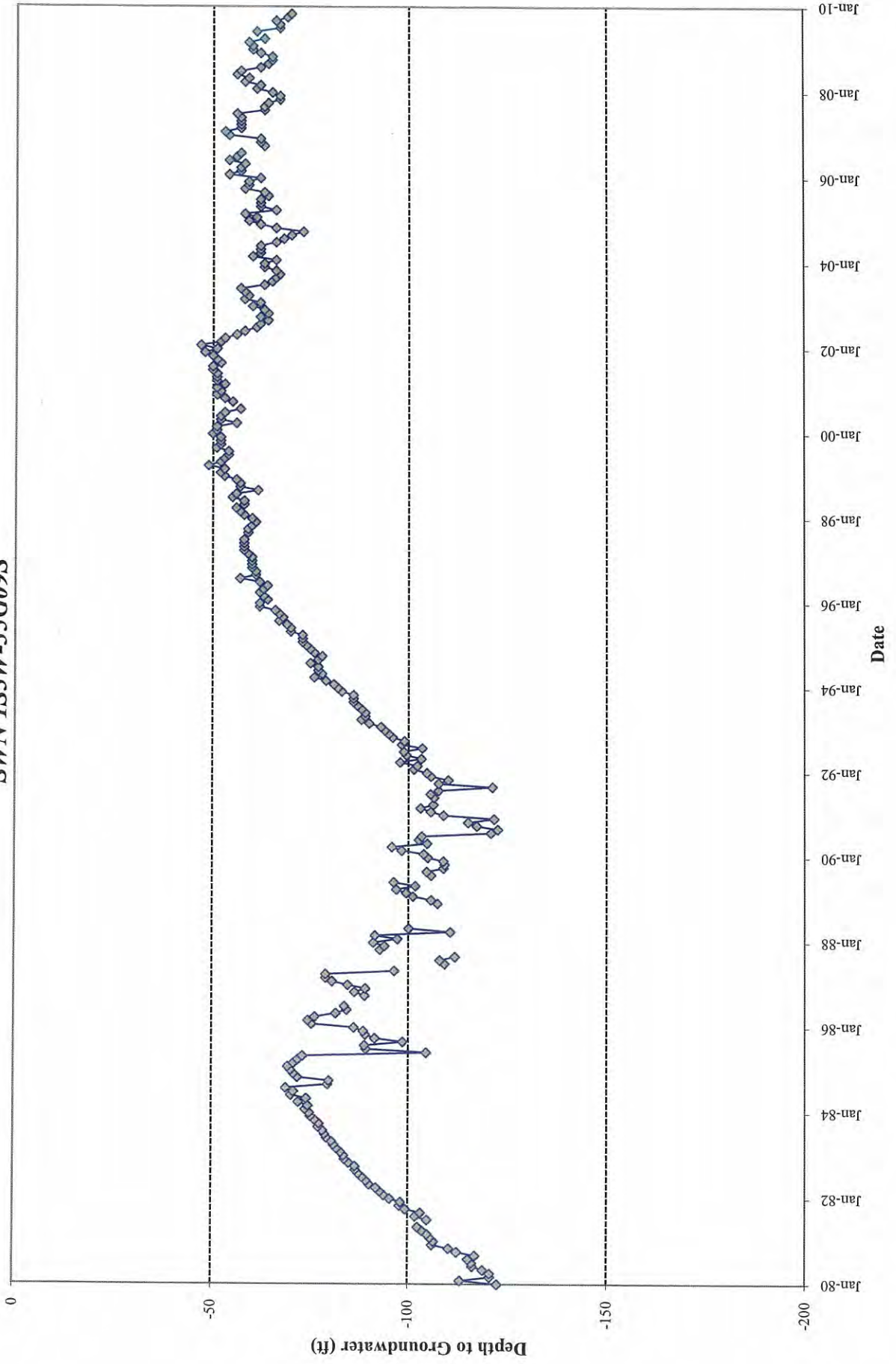




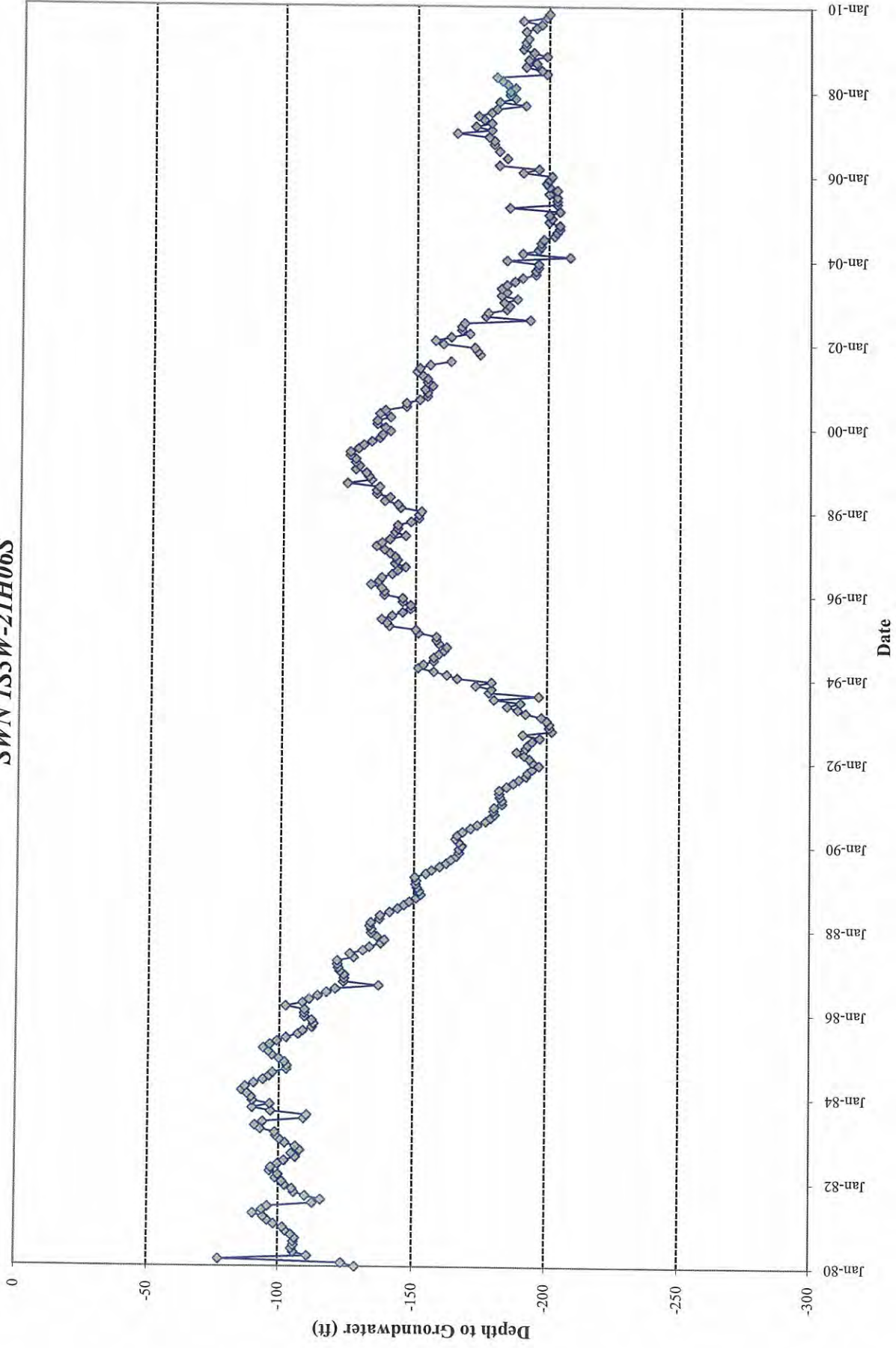
# City of Redlands

## Well 13

*SWN 1S3W-35G09S*



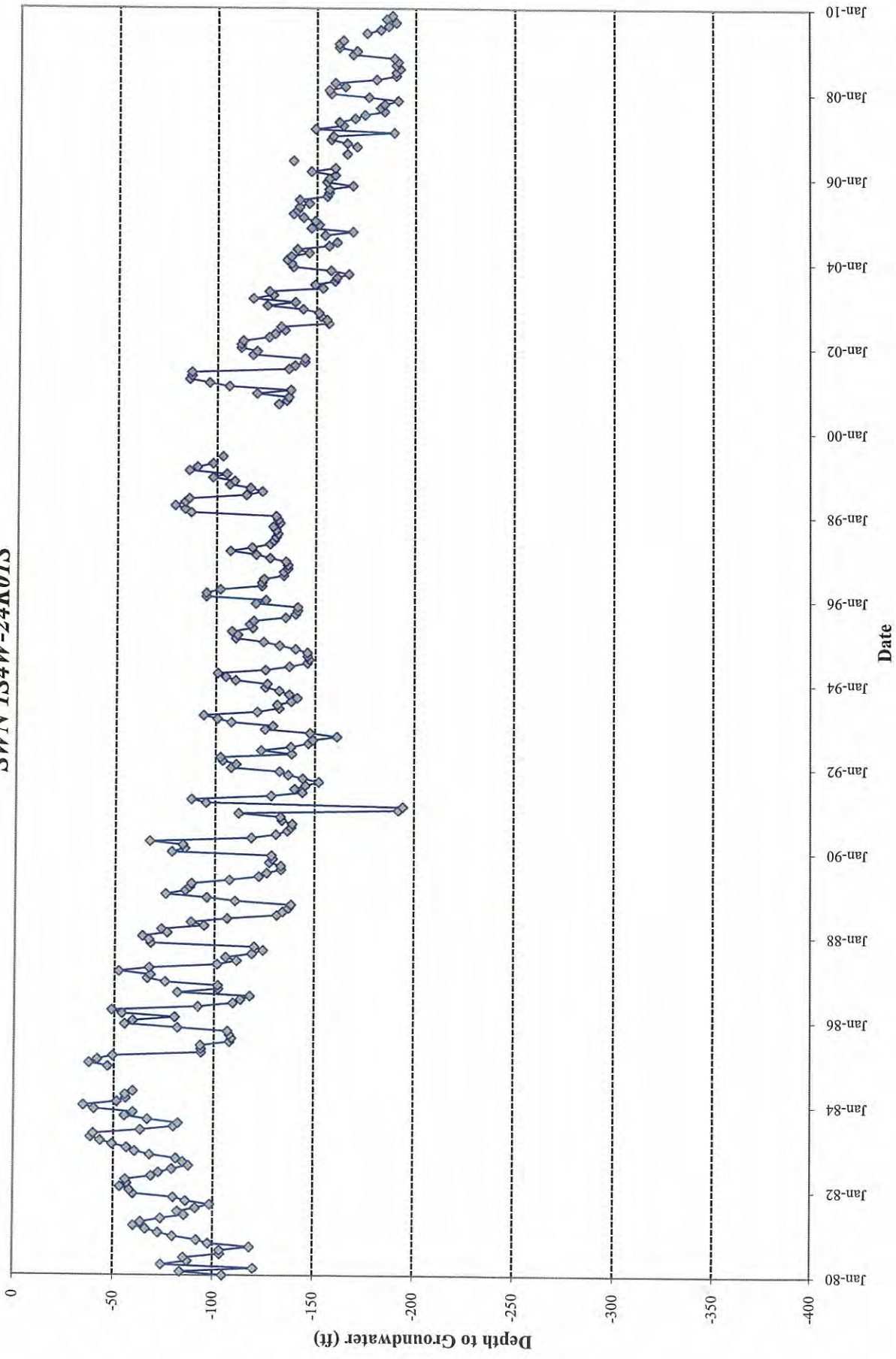
**City of Redlands**  
**Well 30A**  
**SWN 1S3W-21H06S**



# City of Redlands

## Well 34

*SWN IS4W-24K01S*

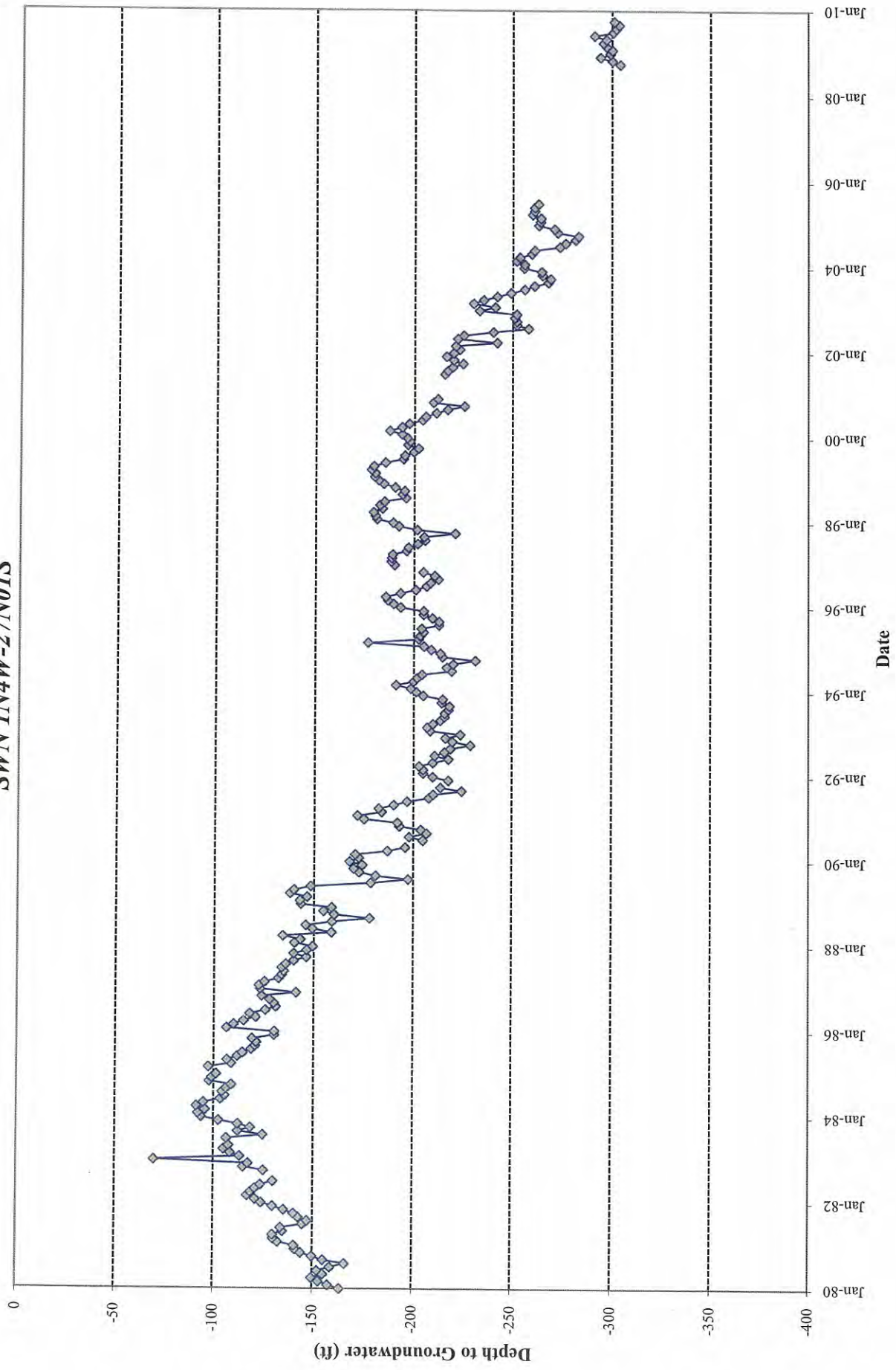




# City of San Bernardino

## 23rd & E

*SWN 1N4W-27N01S*





**Appendix C**  
Production Data  
for the  
Water Year  
July 2008 - June 2009

Monthly Production For Bunker Hill Basin July 2008- June 2009

WELL_NAME	Agency	RecordNum	JULY08	AUG08	SEPT08	OCT08	NOV08	DEC08	JAN09	FEB09	MAR09	APR09	MAY09
Well 13	City of Colton	3601257	56.30	48.00	40.50	48.20	58.50	80.50	76.80	64.60	48.50	41.80	38.20
Well 15	City of Colton	3601260	20.30	0.00	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 16	City of Colton	3602405	119.60	116.40	106.60	109.20	90.40	35.20	81.00	118.00	129.90	117.50	108.50
Well 21	City of Colton	3602793	155.30	157.90	147.00	160.90	164.70	174.50	180.00	171.70	144.20	114.20	164.10
Well 25	City of Colton	3603704	101.40	98.50	66.80	89.00	68.80	63.80	63.80	48.30	86.50	38.40	92.80
Well 27	City of Colton	3604006	154.70	150.60	147.00	148.60	142.10	133.80	145.40	133.20	143.10	137.80	134.70
Well 28	City of Colton	3604007	130.70	107.50	104.00	105.90	100.00	0.00	0.00	0.00	0.00	41.70	107.00
Well 29	City of Colton	3604008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 8	City of Colton	3603154	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mt View 5	City of Loma Linda	3603776	0.77	20.63	0.18	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.17
Mt View 3	City of Loma Linda	3603779	280.60	300.20	292.40	293.20	50.74	35.65	105.92	22.20	159.90	128.50	221.30
Mt View 4	City of Loma Linda	3603721	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Richardson 4	City of Loma Linda	3603720	65.34	59.53	49.72	33.51	60.93	47.54	37.90	30.60	19.50	27.57	41.08
Richardson Well No 1	City of Loma Linda	3608957	37.58	39.53	33.07	33.68	56.66	43.01	33.68	27.47	17.85	73.24	28.46
Richardson Well No 3	City of Loma Linda	3608523	0.77	0.00	0.00	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.17
Agate #2	City of Reedley	3602782	135.89	132.33	97.38	72.39	22.33	70.78	119.55	149.78	161.70	121.99	188.27
Agate #1	City of Reedley	3602781	155.44	85.10	179.78	175.98	84.35	9.09	140.90	163.98	157.08	157.08	56.28
Antport #2	City of Reedley	3602762	82.08	116.34	62.48	62.48	11.31	37.06	102.56	131.71	139.86	106.70	90.23
Antport #1	City of Reedley	3602761	122.77	39.93	50.95	39.63	1.07	0.00	39.26	21.44	20.03	20.03	49.78
Church St	City of Reedley	3602887	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Laguna #3	City of Reedley	3602791	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Laguna #4	City of Reedley	3601290	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Laguna #6	City of Reedley	3602865	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lee Hill	City of Reedley	3602856	100.60	96.74	94.71	96.50	39.53	11.57	0.00	2.71	56.04	80.99	164.78
Madara	City of Reedley	3602855	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Madara #2	City of Reedley	3602854	14.00	131.08	176.34	74.80	0.00	0.00	0.00	19.08	81.61	101.01	30.14
Madara #1	City of Reedley	3602764	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #1	City of Reedley	3601385	165.42	103.24	160.20	208.35	178.41	159.92	136.15	197.00	147.00	111.40	88.82
Mill Creek #2	City of Reedley	3601384	0.00	108.55	71.20	116.38	95.81	89.28	81.44	66.51	39.04	18.36	71.75
Mill Creek #A	City of Reedley	3602351	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #B	City of Reedley	3602352	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #C	City of Reedley	3602353	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #D	City of Reedley	3602354	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #E	City of Reedley	3602355	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #F	City of Reedley	3602356	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #G	City of Reedley	3602357	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #H	City of Reedley	3602358	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #I	City of Reedley	3602359	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #J	City of Reedley	3602360	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #K	City of Reedley	3602361	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #L	City of Reedley	3602362	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #M	City of Reedley	3602363	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #N	City of Reedley	3602364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #O	City of Reedley	3602365	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #P	City of Reedley	3602366	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #Q	City of Reedley	3602367	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #R	City of Reedley	3602368	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #S	City of Reedley	3602369	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #T	City of Reedley	3602370	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #U	City of Reedley	3602371	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #V	City of Reedley	3602372	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #W	City of Reedley	3602373	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #X	City of Reedley	3602374	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #Y	City of Reedley	3602375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #Z	City of Reedley	3602376	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AA	City of Reedley	3602377	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AB	City of Reedley	3602378	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AC	City of Reedley	3602379	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AD	City of Reedley	3602380	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AE	City of Reedley	3602381	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AF	City of Reedley	3602382	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AG	City of Reedley	3602383	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AH	City of Reedley	3602384	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AI	City of Reedley	3602385	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AJ	City of Reedley	3602386	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AK	City of Reedley	3602387	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AL	City of Reedley	3602388	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AM	City of Reedley	3602389	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AN	City of Reedley	3602390	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AO	City of Reedley	3602391	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AP	City of Reedley	3602392	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AQ	City of Reedley	3602393	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AR	City of Reedley	3602394	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AS	City of Reedley	3602395	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AT	City of Reedley	3602396	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AU	City of Reedley	3602397	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AV	City of Reedley	3602398	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AW	City of Reedley	3602399	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AX	City of Reedley	3602400	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mill Creek #AY	City of Reedley	3602401											



Monthly Production For Bunker Hill Basin July 2008- June 2009

WELL NAME	Agency	ReconNum	JULY08	AUG08	SEPT08	OCT08	NOV08	DEC08	JAN09	FEB09	MAR09	APR09	MAY09
GARNER WEL	Riverside-cage	3604000	30282	30064	29364	31346	10296	0.00	0.00	0.00	175.17	157.85	265.66
GARNER NO.6 WELL	Riverside-cage	3604294	234.14	235.34	230.81	255.56	137.34	0.00	0.00	0.00	24.54	104.01	236.55
PAOB NO.5 WELL	Riverside-cage	3602484	370.33	154.97	159.09	159.09	159.09	101.70	16.13	0.00	0.00	0.00	0.00
PAOB NO.7 WELL	City of Riverside	3602778	194.62	254.47	177.91	149.40	134.61	69.25	81.76	7.51	151.61	124.87	247.17
PAOB NO.8 WELL	Riverside-cage	3603929	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCHREER WELL	Riverside-cage	3603555	160.99	221.73	121.15	22.26	69.97	136.42	68.11	6.17	111.13	134.99	95.63
TITLES WELL	Riverside-cage	3601489	410.98	367.15	279.07	318.32	162.68	0.00	0.00	0.00	0.00	63.46	305.13
TIPPECANOE WELL	Riverside-cage	3601483	85.18	77.82	70.46	84.85	47.76	0.00	0.00	0.00	52.26	46.66	87.92
WARREN NO.1 WELL	Riverside-cage	3603970	463.95	375.15	415.00	393.85	447.72	447.72	10.04	10.04	0.00	0.00	27.87
WARREN NO.4 WELL	Riverside-cage	3601243	61.30	158.17	40.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lower 4	WYWD	3600995	85.44	133.75	13.02	8.04	14.70	0.00	0.00	0.00	0.00	2.58	0.00
Clyde Basin Div	WYWD	3600303	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unit 2	WYWD	3601725	0.00	0.00	164.39	34.91	0.00	62.23	128.28	31.61	5.50	31.80	87.97
Well 10A	WYWD	3600995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well 12A	WYWD	3605001	353.00	185.52	186.39	31.91	0.00	62.23	113.28	31.61	5.50	31.80	87.97
Well 14A	WYWD	3604000	41.35	350.04	71.15	44.66	47.33	32.28	49.36	4.81	6.90	4.87	41.50
Well 14B	WYWD	3604294	173.68	173.68	173.68	173.68	173.68	173.68	173.68	173.68	173.68	173.68	173.68
Well 14C	WYWD	3604014	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32
Well 14D	WYWD	3604014	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32	164.32
Well No.1	WYWD	3600937	0.00	0.00	61.88	58.91	43.82	51.99	95.53	40.65	28.72	70.38	73.27
Well No.12	WYWD	3601000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.13	WYWD	3601003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.14	WYWD	3600999	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.15	WYWD	3601848	0.00	105.88	133.31	107.70	79.09	64.79	62.33	110.02	5.25	7.48	112.65
Well No.2	WYWD	3601914	212.95	188.64	170.19	196.31	105.82	34.37	0.00	0.00	101.11	186.04	204.87
Well No.3	WYWD	3600302	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.30	WYWD	3602766	148.79	146.82	142.33	158.91	114.22	60.50	55.49	54.05	37.88	50.74	95.50
Well No.34	WYWD	3602897	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.35	WYWD	3603055	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.36	WYWD	3603054	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.4	WYWD	3600304	0.00	172.92	264.77	72.50	47.30	35.85	158.06	136.35	84.46	0.00	0.00
Well No.5	WYWD	3600305	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.7	WYWD	3600997	168.48	180.25	150.34	104.02	113.14	110.54	147.29	108.95	88.00	83.95	126.95
Well No.8	WYWD	3600996	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well No.8A	WYWD	3603778	248.43	240.26	202.98	124.52	47.20	102.63	175.68	94.36	134.94	80.05	84.52
Well No.9	WYWD	3601002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Station 59	Meeks & Dalley	3601887	221.09	221.45	214.01	224.11	185.63	0.39	0.32	0.32	16.63	0.82	0.00
Station 91	Meeks & Dalley	3603215	125.68	125.26	120.02	114.4	88.93	0.34	0	0.25	9.56	0.29	0
<b>Totals for Months</b>	<b>Used In</b>	<b>Water Year</b>	<b>22429.85</b>	<b>21303.56</b>	<b>20106.28</b>	<b>17979.89</b>	<b>13295.82</b>	<b>9721.05</b>	<b>11984.32</b>	<b>8849.64</b>	<b>12772.65</b>	<b>15219.03</b>	<b>18586.20</b>
		<b>July 2008 to</b>											
		<b>June 2009</b>											

Monthly Production For Bunker Hill Basin July 2008 - June 2009

WELL NAME	AGENCY	JUN09	JULY09	AUG09	SEPT09	OCT09	NOV09	DEC09	Subbasin Name
HANFORD 1	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone Santa Ana Wash
UDA WELL 11	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone Santa Ana Wash
KENWOOD 1 WELL	City of San Bernardino	9.84	9.84	9.38	7.00	6.19	5.13	5.22	5.22 Pressure Zone Santa Ana Wash
KENWOOD 2 WELL	City of San Bernardino	134.88	130.83	97.38	64.99	3.54	18.00	25.53	Bunker Hill Northeast of 215 Freeway
LEROY WELL	City of San Bernardino	64.90	233.16	188.15	184.22	163.53	160.00	17.32	Bunker Hill Northwest of 215 Freeway
LYNWOOD WELL	City of San Bernardino	75.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill West of Mentone Fault
LITTLE CREEK 2 WELL	City of San Bernardino	160.63	186.86	153.81	172.65	39.27	7.08	5.31	Bunker Hill West of Mentone Fault
LITTLE CREEK 3 WELL	City of San Bernardino	52.83	53.70	52.28	49.88	5.43	31.03	0.00	0.00 Lytle Basin Southeast of Barrier J
MALLOYING 3 WELL	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Lytle Basin Southeast of Barrier J
MCFARLAND JOHNSON	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone North of Santa Ana Wash
MILL & O WELL	City of San Bernardino	31.37	30.87	31.24	29.35	26.88	32.34	34.47	Pressure Zone Santa Ana Wash
MT VERNON WATER CO	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill Southwest of 215 Freeway
NEWMARK 1 WELL	City of San Bernardino	34.57	70.33	39.44	0.00	0.00	0.00	0.00	Bunker Hill West of Mentone Fault
NEWMARK 2 WELL	City of San Bernardino	56.87	64.47	26.93	72.67	5.76	11.45	30.56	Bunker Hill West of Mentone Fault
NEWMARK 3 EXTRA WELL	City of San Bernardino	136.09	138.30	137.47	129.16	133.58	115.50	105.56	Bunker Hill West of Mentone Fault
NEWMARK 4 WELL	City of San Bernardino	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill West of Mentone Fault
OLIVE & GARNER WELL	City of San Bernardino	174.80	190.19	47.43	194.20	73.95	0.66	0.87	Pressure Zone North of Santa Ana Wash
PERRIS HILL 4 WELL	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone North of Santa Ana Wash
PERRIS HILL 5 WELL	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone North of Santa Ana Wash
SMITH 1	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone Santa Ana Wash
SOUTH G ST	City of San Bernardino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone Santa Ana Wash
VINCENT WELL	City of San Bernardino	0.00	97.24	135.29	153.89	7.88	0.32	5.51	Bunker Hill West of Mentone Fault
WATERMAN AVE. WELL	City of San Bernardino	134.98	265.25	279.75	44.73	224.48	66.65	11.72	Bunker Hill West of Mentone Fault
Well 11	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone North of Santa Ana Wash
Well 27	EWVD	26.87	37.36	37.33	36.69	33.12	13.75	26.78	Bunker Hill West of Mentone Fault
Well 39	EWVD	105.10	141.27	138.06	117.01	86.66	43.47	11.72	Bunker Hill West of Mentone Fault
Well 40	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone North of Santa Ana Wash
Well 41	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone North of Santa Ana Wash
Well 54	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone Santa Ana Wash
Well 94	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone Santa Ana Wash
Well 107	EWVD	118.12	84.01	86.99	89.61	88.63	113.92	89.37	Bunker Hill West of Mentone Fault
Well 120	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill West of Mentone Fault
Well 115	EWVD	96.72	138.31	109.72	102.38	87.46	87.46	19.94	Bunker Hill West of Mentone Fault
Well 141	EWVD	71.55	106.91	51.39	43.95	53.53	31.18	18.35	Pressure Zone North of Santa Ana Wash
Well 142	EWVD	18.46	62.25	76.61	69.78	70.69	50.56	39.57	Bunker Hill West of Mentone Fault
Well 143	EWVD	63.66	131.85	118.11	116.16	81.71	73.57	0.00	Bunker Hill West of Mentone Fault
Well 246	EWVD	21.38	10.84	17.42	17.42	24.78	0.00	0.00	Bunker Hill West of Mentone Fault
Well 347	EWVD	147.51	262.39	250.31	250.31	160.07	111.35	86.90	Bunker Hill West of Mentone Fault
Well 351	EWVD	267.75	311.17	296.68	315.70	193.81	131.79	72.98	Pressure Zone North of Santa Ana Wash
Well 384	EWVD	110.47	228.87	251.59	272.69	247.13	190.25	0.00	0.00 Pressure Zone North of Santa Ana Wash
Well 11A	EWVD	0.76	0.34	0.00	0.00	0.00	0.00	0.00	0.00 Pressure Zone North of Santa Ana Wash
Well 132-2	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill West of Mentone Fault
Well 135-1	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill West of Mentone Fault
Well 135-2	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill West of Mentone Fault
Well 244	EWVD	78.45	89.36	102.26	115.17	116.08	140.99	153.90	Bunker Hill West of Mentone Fault
Well 248	EWVD	131.92	155.13	98.49	172.33	108.70	61.67	41.26	Bunker Hill West of Mentone Fault
Well 25A	EWVD	6.11	11.92	13.05	14.52	12.24	12.06	9.61	Bunker Hill West of Mentone Fault
Well 28A	EWVD	205.11	207.69	202.71	193.30	204.22	189.79	212.78	Pressure Zone North of Santa Ana Wash
Well 40A	EWVD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Bunker Hill West of Mentone Fault
Well 5A	EWVD	56.16	95.75	90.88	79.24	46.19	56.81	36.35	Pressure Zone North of Santa Ana Wash
FU 1	Fontana Union Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Lytle Basin Southeast of Barrier J
FU 13(F36A)	Fontana Union Water	210.18	0.00	201.11	184.17	183.42	173.34	102.16	Lytle Basin Southeast of Barrier J
FU 4(F29A)	Fontana Union Water	135.66	128.83	111.22	96.84	96.69	90.02	64.46	Lytle Basin Southeast of Barrier J
FU 8(F34A)	Fontana Union Water	0.23	45.64	59.30	0.00	0.14	0.14	0.07	Lytle Basin Southeast of Barrier J
FU Unknown	Fontana Union Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 Lytle Basin Northwest of Barrier J
FU2 (F40A)	Fontana Union Water	87.16	85.73	80.20	3.79	0.00	13.15	56.03	Lytle Basin Southeast of Barrier J
FU2 (F42A)	Fontana Union Water	13.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00 Lytle Basin Northwest of Barrier J
FU3 (F28A)	Fontana Union Water	91.41	99.22	95.81	0.00	0.00	0.01	0.02	0.00 Lytle Basin Northwest of Barrier J
FU3 (F32A)	Fontana Union Water	75.05	76.39	58.65	0.00	82.79	80.29	55.00	Lytle Basin Northwest of Barrier J
FU3 (F33A)	Fontana Union Water	133.18	127.84	122.46	109.94	97.13	116.72	42.13	Lytle Basin Northwest of Barrier J
COUETH WELL	Riverside Highland	2.16	71.51	116.79	68.46	29.40	100.67	26.54	Pressure Zone North of Santa Ana Wash
COUETH WELL	Riverside Highland	44.20	324.99	380.32	306.17	37.36	49.04	156.71	Pressure Zone North of Santa Ana Wash
COUETH WELL	Riverside-Gage	281.60	279.80	279.80	279.80	287.12	86.90	0.00	Pressure Zone North of Santa Ana Wash
ECLST-WELL	Riverside-Gage	0.00	250.07	201.41	202.58	0.00	0.00	0.00	Pressure Zone North of Santa Ana Wash
FIRST STWELL IRA	Riverside-Gage	246.34	258.42	251.55	224.95	0.00	0.00	0.00	Pressure Zone North of Santa Ana Wash
FLUME #2 WELL	Riverside-Gage	304.38	335.36	308.64	280.05	284.63	260.77	237.40	Pressure Zone North of Santa Ana Wash
FLUME #4 WELL	Riverside-Gage	285.60	282.25	275.90	260.17	260.17	260.17	260.17	Pressure Zone North of Santa Ana Wash
GAGE 27-1 WELL	Riverside-Gage	335.09	288.44	289.24	311.09	310.63	287.17	287.17	Pressure Zone Santa Ana Wash
GAGE 27-2 WELL	Riverside-Gage	60.90	246.10	246.10	246.10	246.10	246.10	246.10	Pressure Zone Santa Ana Wash
GAGE 28-1 WELL	Riverside-Gage	183.10	199.04	198.34	203.32	203.32	203.32	203.32	Pressure Zone Santa Ana Wash
GAGE 28-2 WELL	Riverside-Gage	182.47	198.34	198.34	203.32	203.32	203.32	203.32	Pressure Zone Santa Ana Wash
GAGE 31-1 WELL	Riverside-Gage	18.45	3.76	3.76	3.76	3.76	3.76	3.76	Pressure Zone Santa Ana Wash
GAGE 44-1B WELL	Riverside-Gage	241.31	222.17	196.93	53.34	20.54	294.81	5.69	1.19 Pressure Zone Santa Ana Wash
GAGE 55-1 WELL	Riverside-Gage	0.00	236.14	236.14	195.68	184.78	153.83	0.00	0.00 Pressure Zone Santa Ana Wash
GAGE 56-1 WELL	Riverside-Gage	153.01	164.82	145.89	129.01	150.93	102.34	0.00	0.00 Pressure Zone Santa Ana Wash
GAGE 59-1 WELL	Riverside-Gage	119.60	70.85	200.24	200.38	224.55	207.97	0.00	0.00 Pressure Zone Santa Ana Wash
GAGE 59-2 WELL	Riverside-Gage	388.84	377.63	283.80	209.16	114.69	284.53	314.95	Pressure Zone Santa Ana Wash
GAGE 59-3 WELL	Riverside-Gage	215.02	274.05	331.38	306.85	325.77	305.04	95.95	Pressure Zone Santa Ana Wash
GAGE 59-4 WELL	Riverside-Gage	594.03	403.03	295.90	221.44	243.19	238.84	114.48	Pressure Zone Santa Ana Wash
GARNER 8 WELL	Riverside-Gage	211.54	224.35	219.38	203.43	203.43	203.43	203.43	Pressure Zone North of Santa Ana Wash
GARNER C WELL	Riverside-Gage	313.07	324.11	324.11	324.11	324.11	324.11	324.11	Pressure Zone North of Santa Ana Wash
GARNER D WELL	Riverside-Gage	249.45	265.27	269.38	252.55	252.55	252.55	252.55	Pressure Zone North of Santa Ana Wash
GARNER NO 5 WELL	Riverside-Gage	39.59	109.96	191.24	169.68	103.81	154.41	61.28	Pressure Zone North of Santa Ana Wash

Sub-Basin Production Summary Calculations

July 2008- June 2009

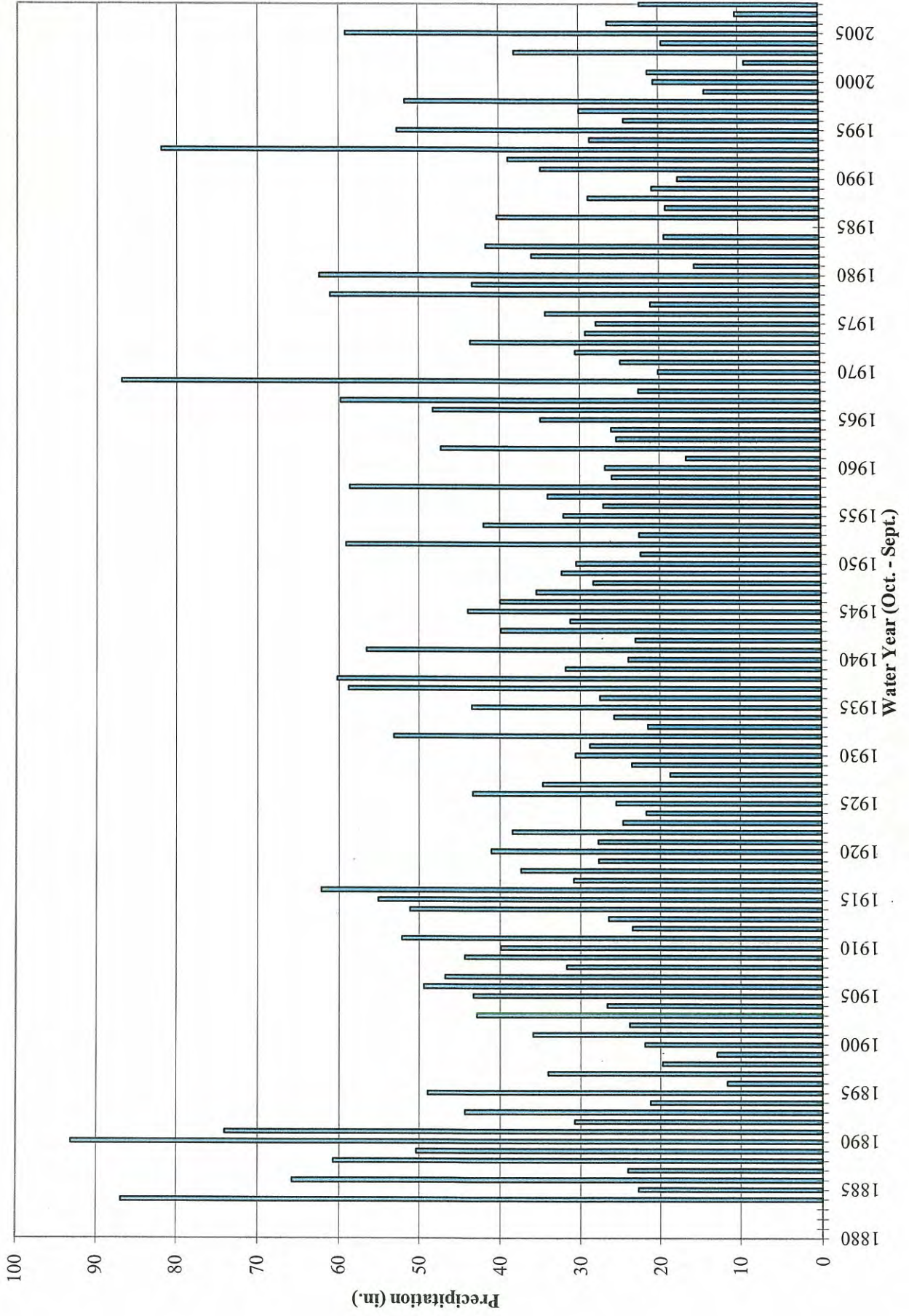
Subbasin	Count	JULY_08	AUG_08	SEPT_08	OCT_08	NOV_08	DEC_08	JAN_09	FEB_09	MAR_09	APR_09	MAY_09	JUN_09	JULY_09	AUG_09	SEPT_09	Jul08	Jun09
Bunker Hill I Northeast of 215 Freeway	12	1016.99	965.26	1003.72	865.47	459.06	198.24	244.85	163.36	352.18	606.99	921.54	587.65	1003.39	1025.74	848.09		7,385
Bunker Hill I Southwest of 215 Freeway	22	1569.52	1485.74	1433.07	1372.07	1237.25	1111.90	1302.47	987.45	1000.65	1125.20	1513.85	1181.58	1375.98	1282.88	1147.31		15,321
Bunker Hill II East of Mentone Fault Norl	12	535.88	571.30	534.18	554.96	358.93	345.56	354.50	377.40	484.11	432.73	629.62	539.73	675.51	613.27	677.72		5,719
Bunker Hill II East of Mentone Fault Sou	6	114.24	273.66	252.96	236.49	175.13	17.10	14.49	10.45	32.00	100.93	214.27	239.40	262.83	356.91	255.97		1,681
Bunker Hill II West of Mentone Fault	51	4884.20	4928.46	4153.16	3203.51	2321.66	1080.37	1771.73	1331.16	2237.38	2845.80	3183.38	2953.98	4261.74	3778.64	3608.55		34,895
Lytile Basin Northwest of Barrier J	5	295.74	243.36	217.35	190.94	168.43	172.50	215.76	194.44	248.68	226.50	182.49	196.66	179.32	173.92	156.65		2,553
Lytile Basin Southeast of Barrier J	29	1778.52	1962.55	2184.58	1626.41	1252.42	834.84	1697.68	1011.39	1240.31	1366.98	1510.21	1301.63	1418.63	1721.44	1240.78		17,768
Pressure Zone North of Santa Ana Was	49	7701.07	7952.98	7250.45	7097.40	5586.76	4406.62	4322.81	3234.39	4973.30	5586.08	7175.52	6489.86	8161.00	7903.87	8134.28		71,777
Pressure Zone Santa Ana Wash	32	4533.70	3452.25	3078.81	2832.65	1736.18	1053.91	2060.04	1539.61	2204.05	2927.83	3255.32	3178.23	3773.45	3960.32	3703.96		31,853
<b>Totals</b>		<b>22429.85</b>	<b>21835.56</b>	<b>20108.28</b>	<b>17979.89</b>	<b>13295.82</b>	<b>9221.05</b>	<b>11984.32</b>	<b>8849.64</b>	<b>12772.65</b>	<b>15219.03</b>	<b>18586.20</b>	<b>16668.71</b>	<b>21111.83</b>	<b>20817.00</b>	<b>19773.32</b>		<b>188,951</b>





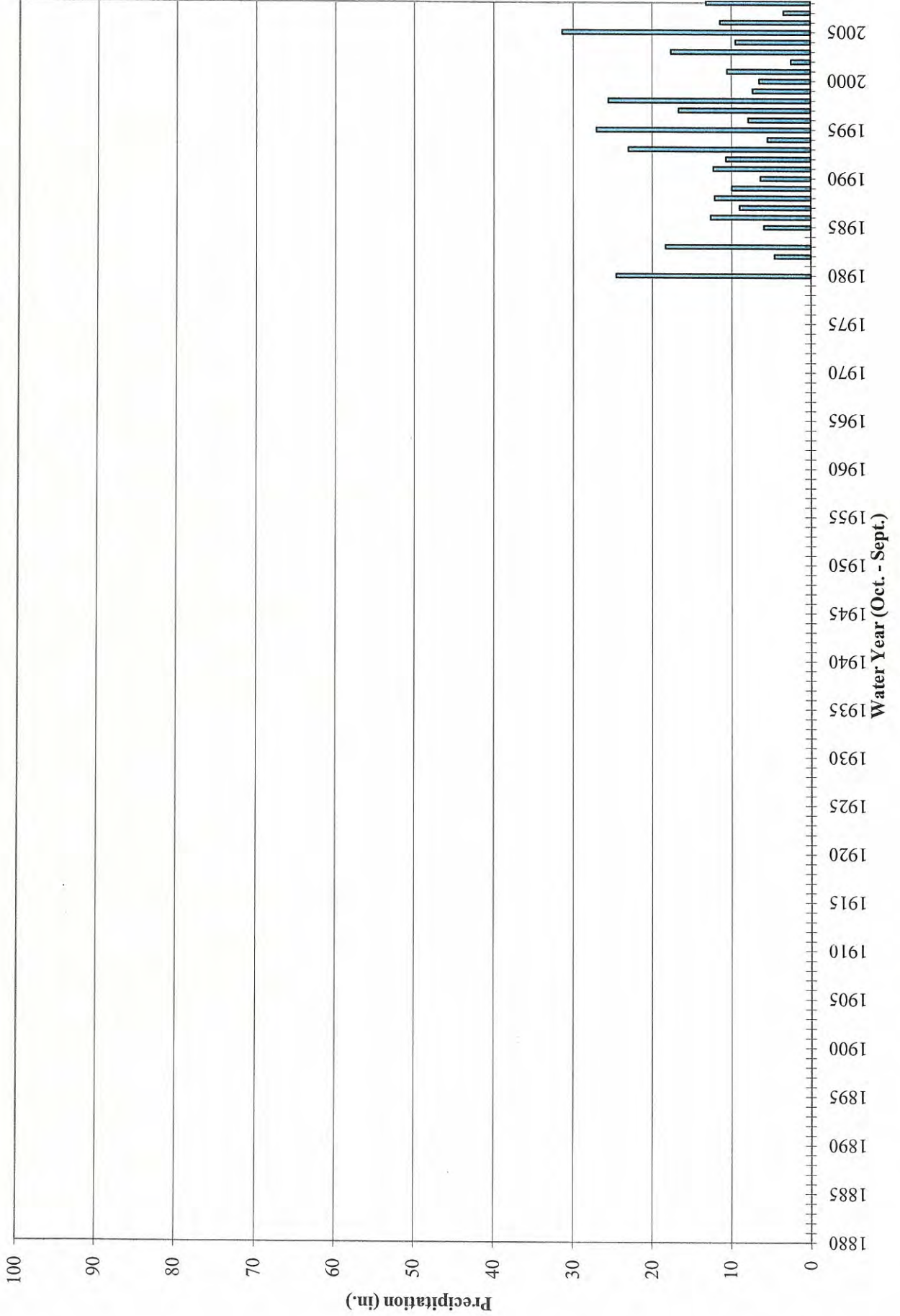
**Appendix D**  
Historic Annual  
Precipitation Graphs

# Historic Annual Precipitation Big Bear Lake Dam



# Historic Annual Precipitation

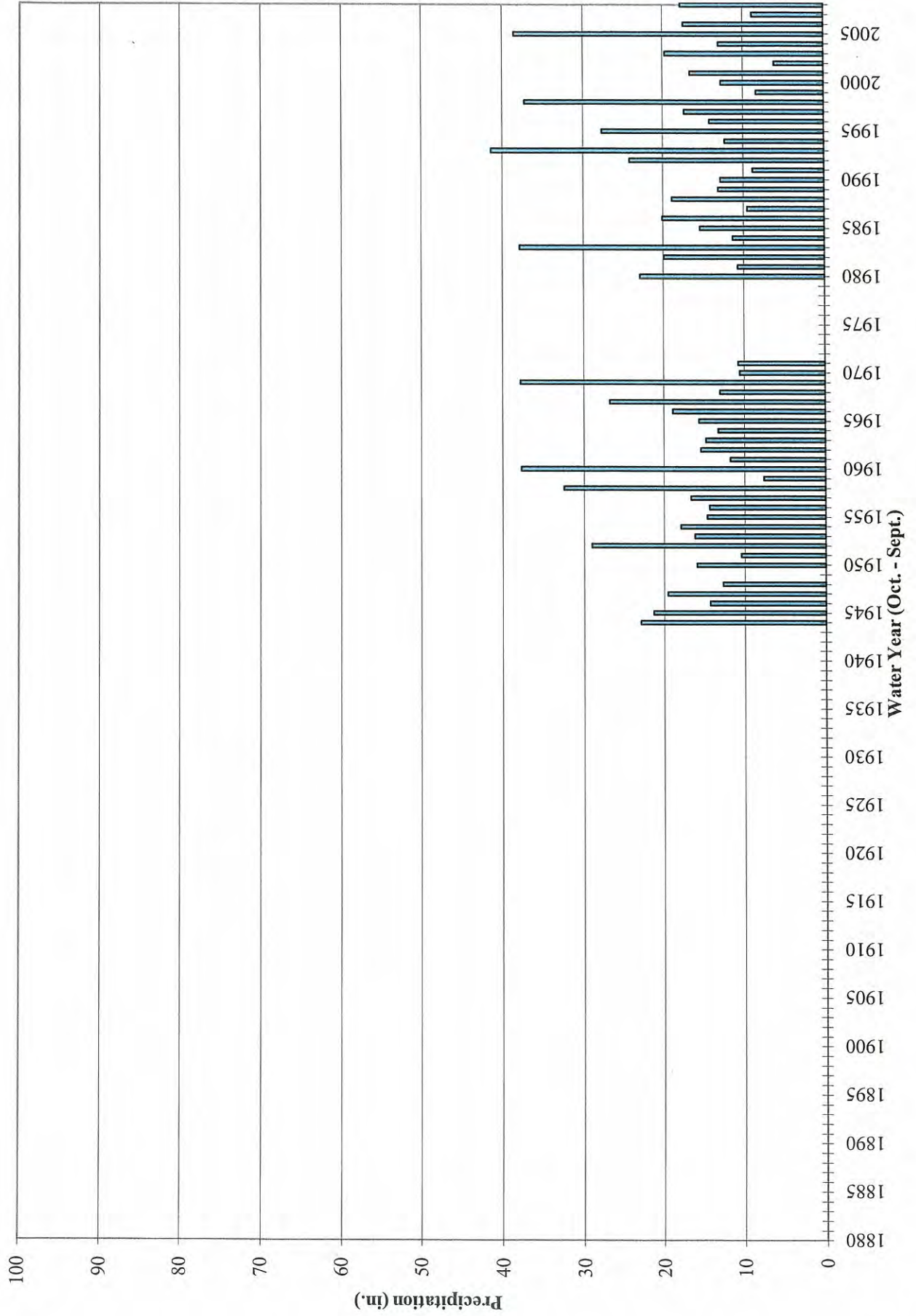
## Crafton Hills



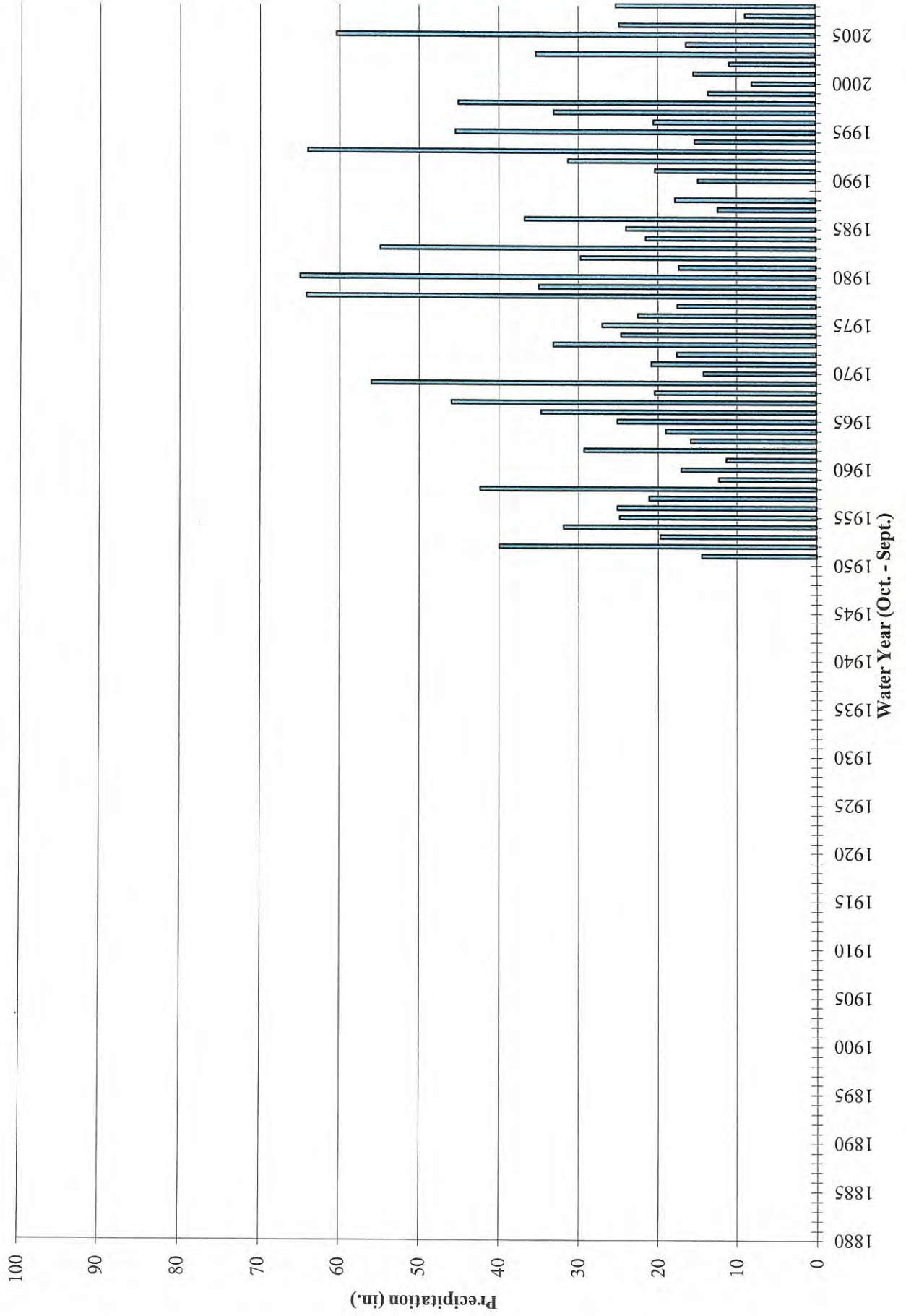


# Historic Annual Precipitation

*Del Rosa Ranger Station*

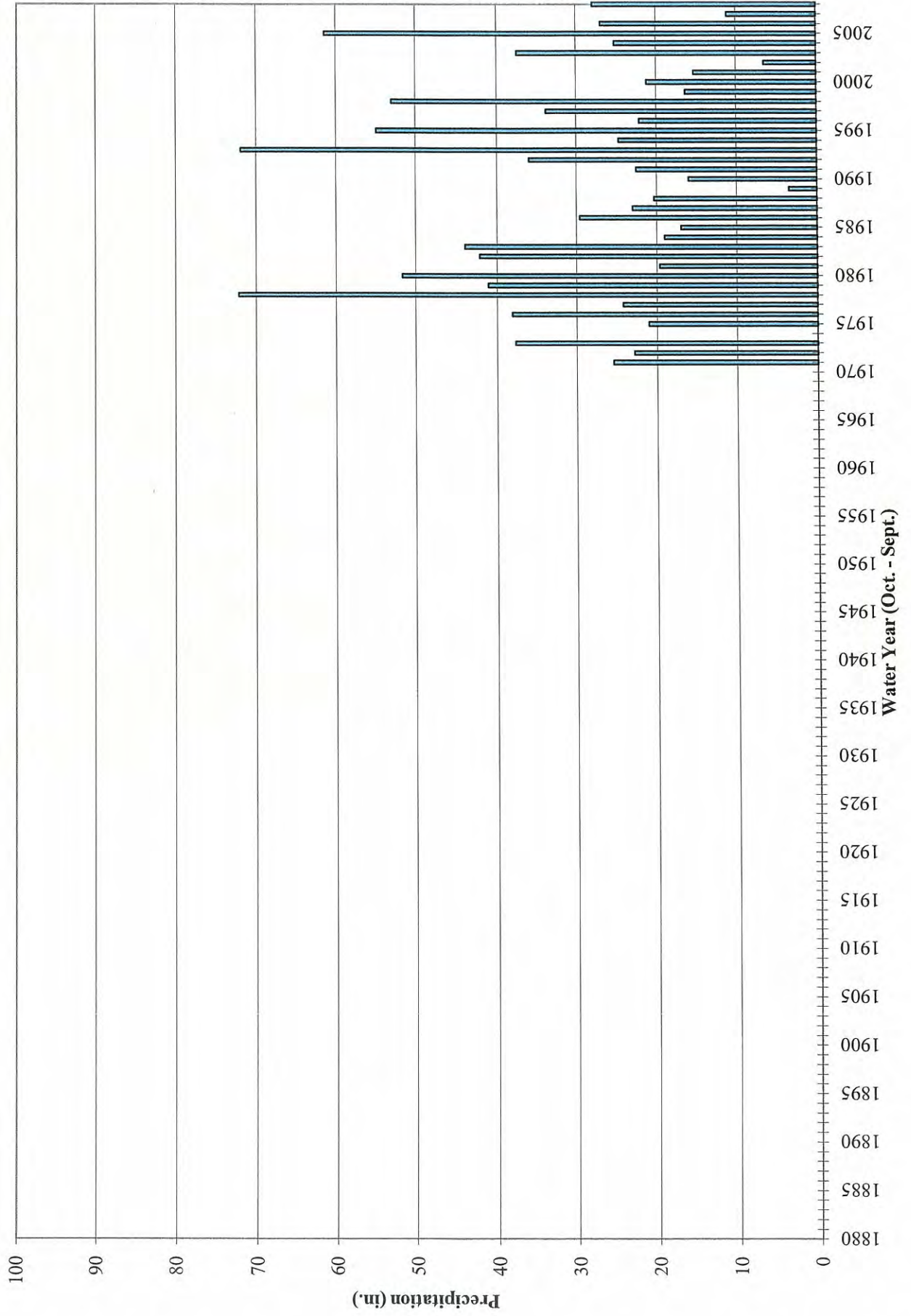


# Historic Annual Precipitation *Devore CDF*



# Historic Annual Precipitation

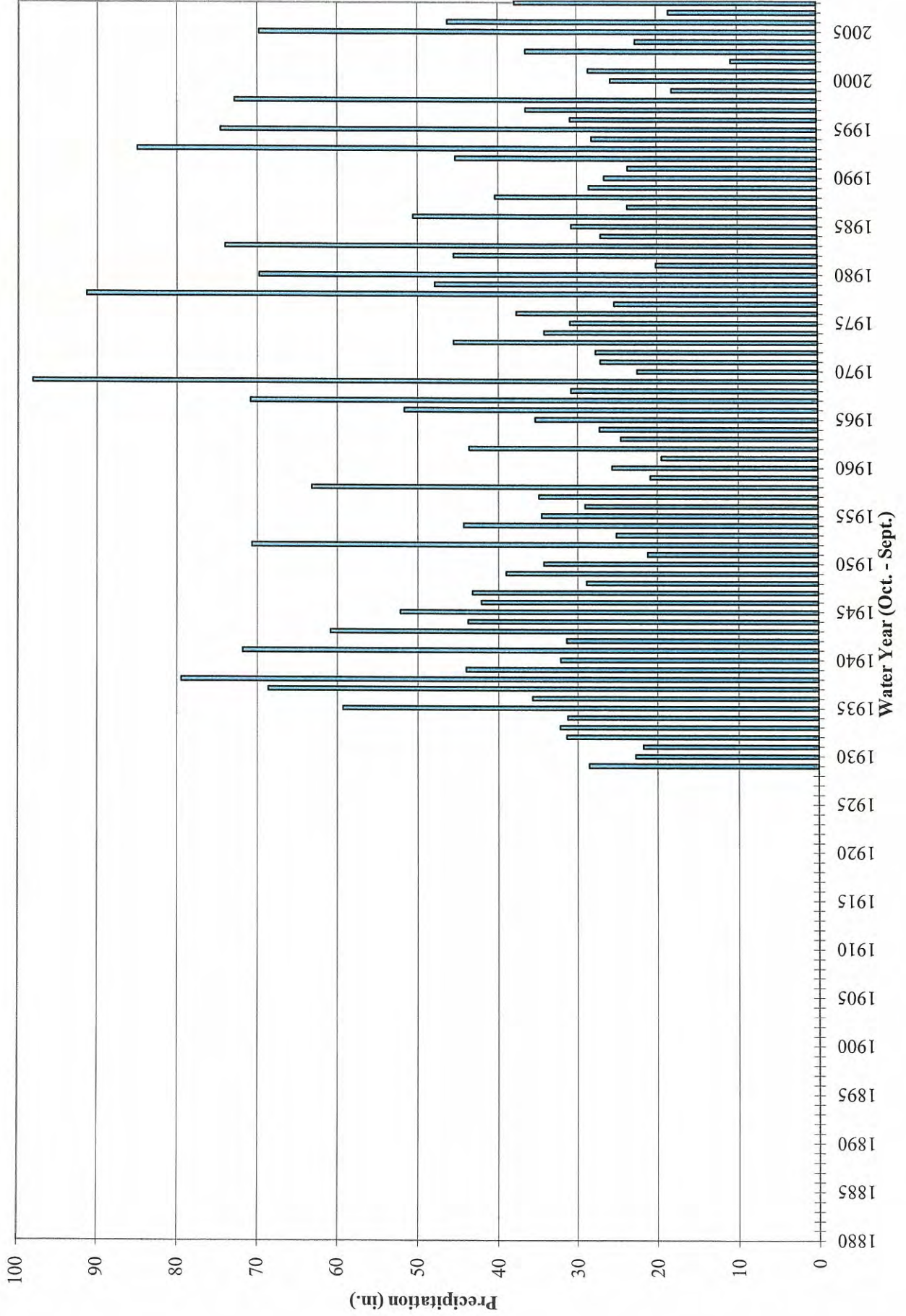
## Fallsvaley





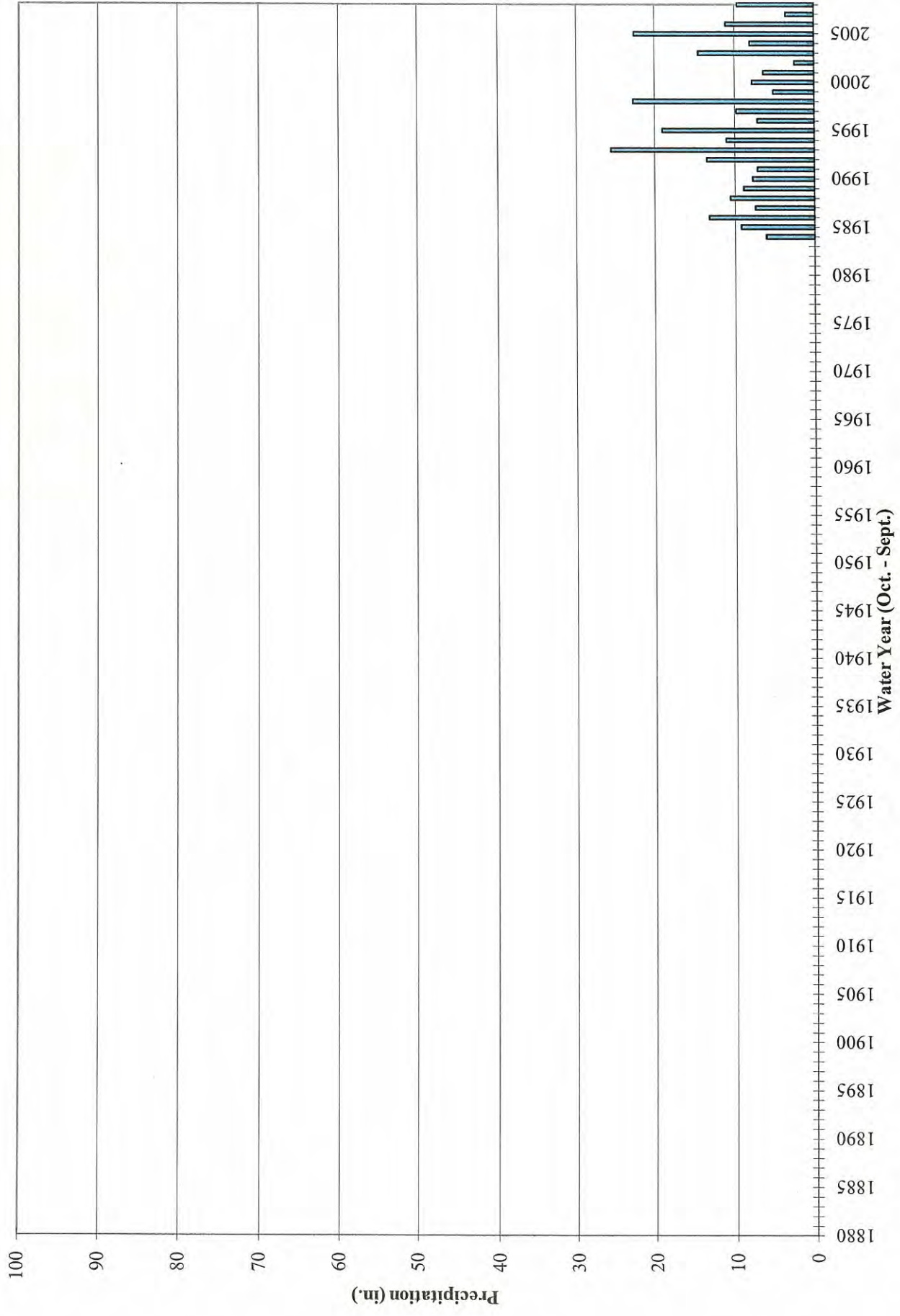
# Historic Annual Precipitation

*Lake Arrowhead*



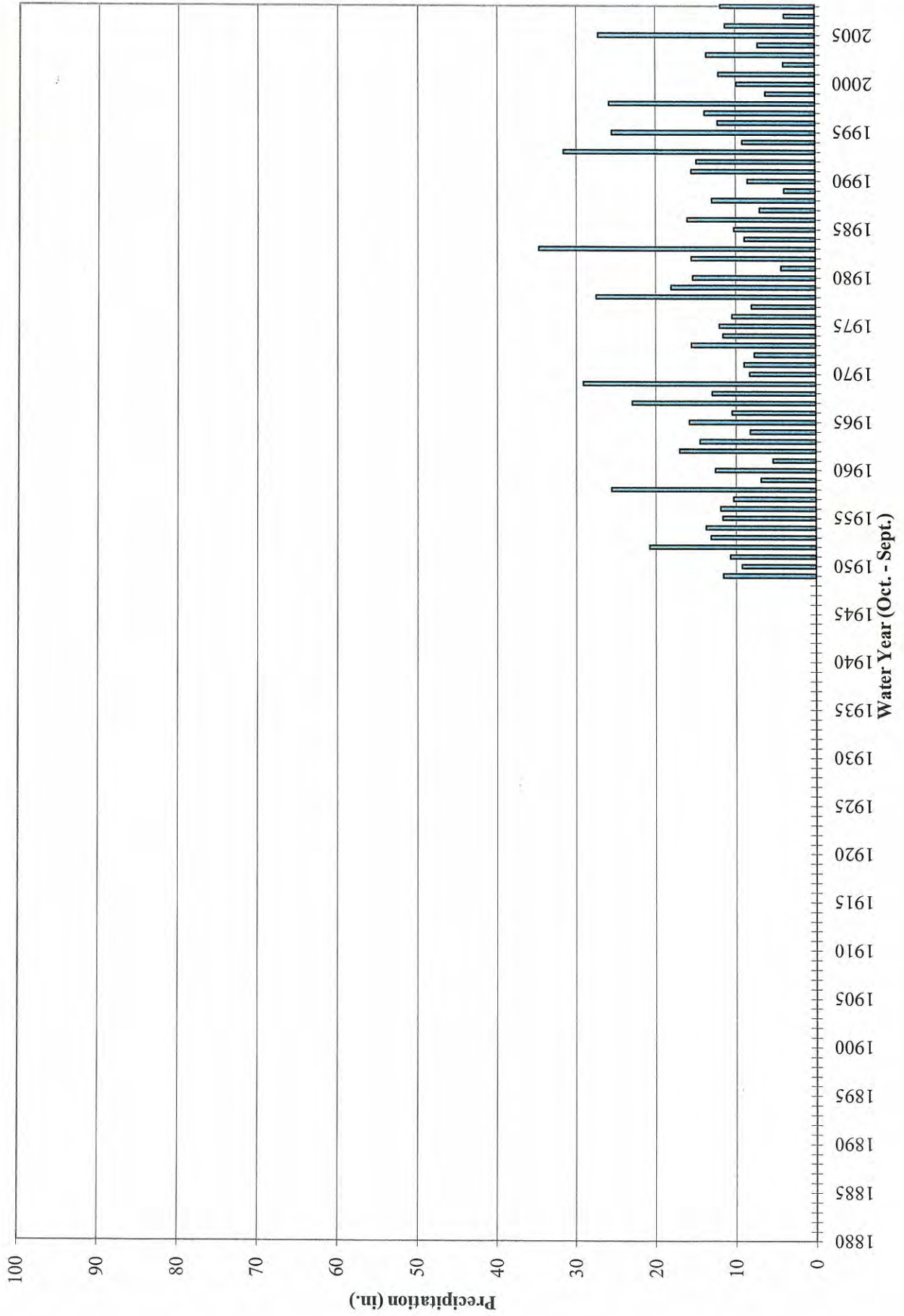
# Historic Annual Precipitation

## Loma Linda Fire Department



# Historic Annual Precipitation

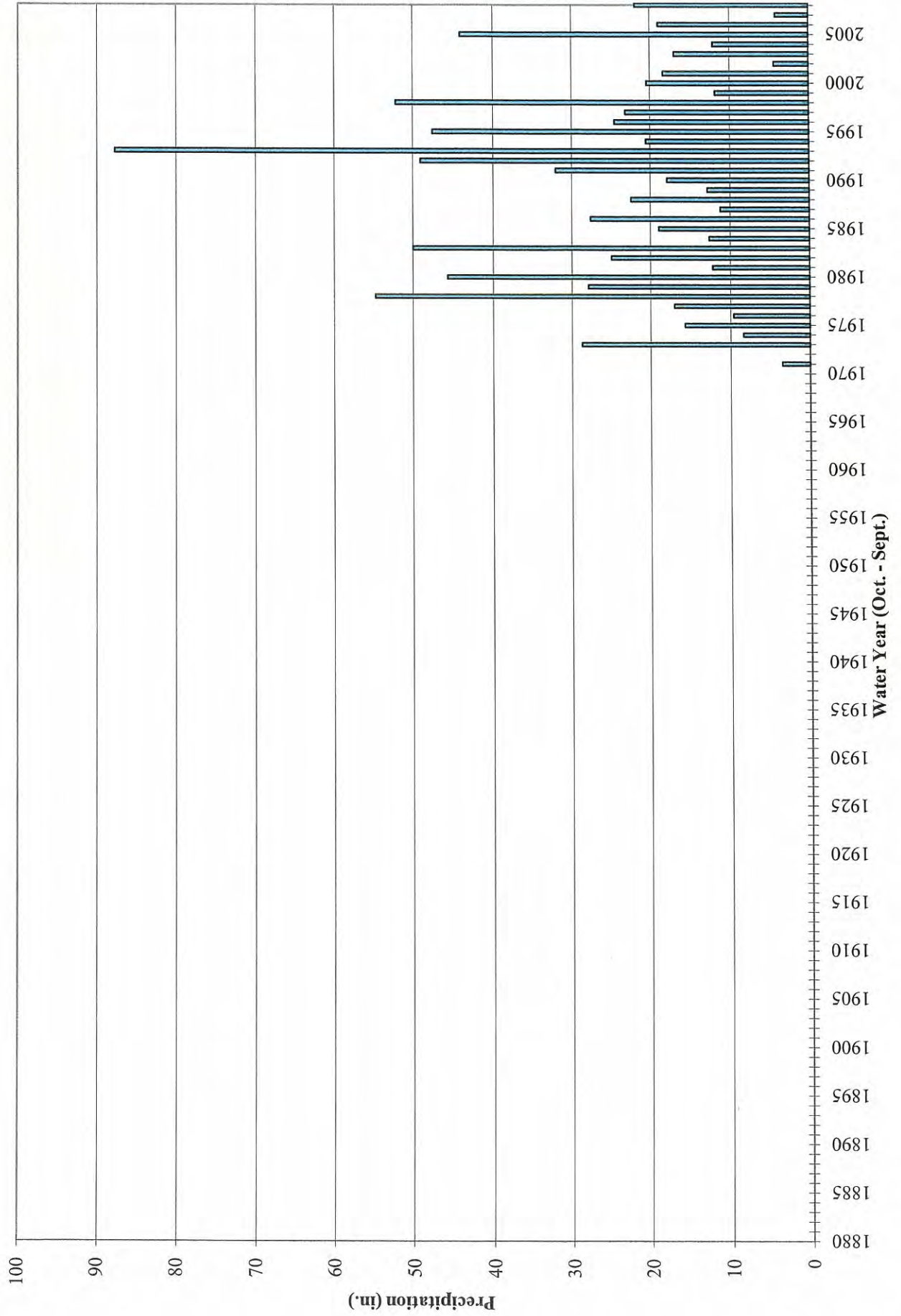
*Lytle Creek at Foothill Blvd.*



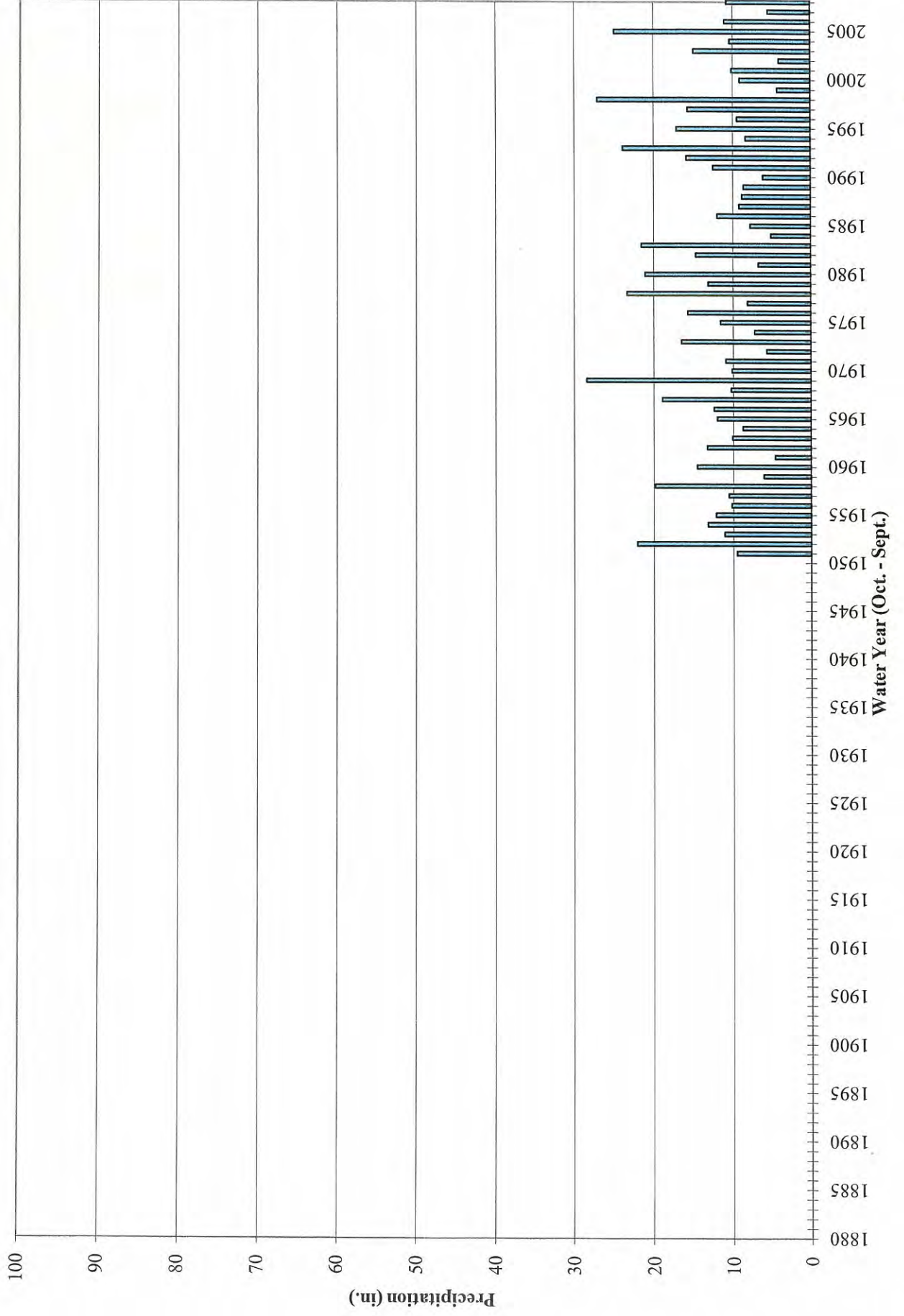


# Historic Annual Precipitation

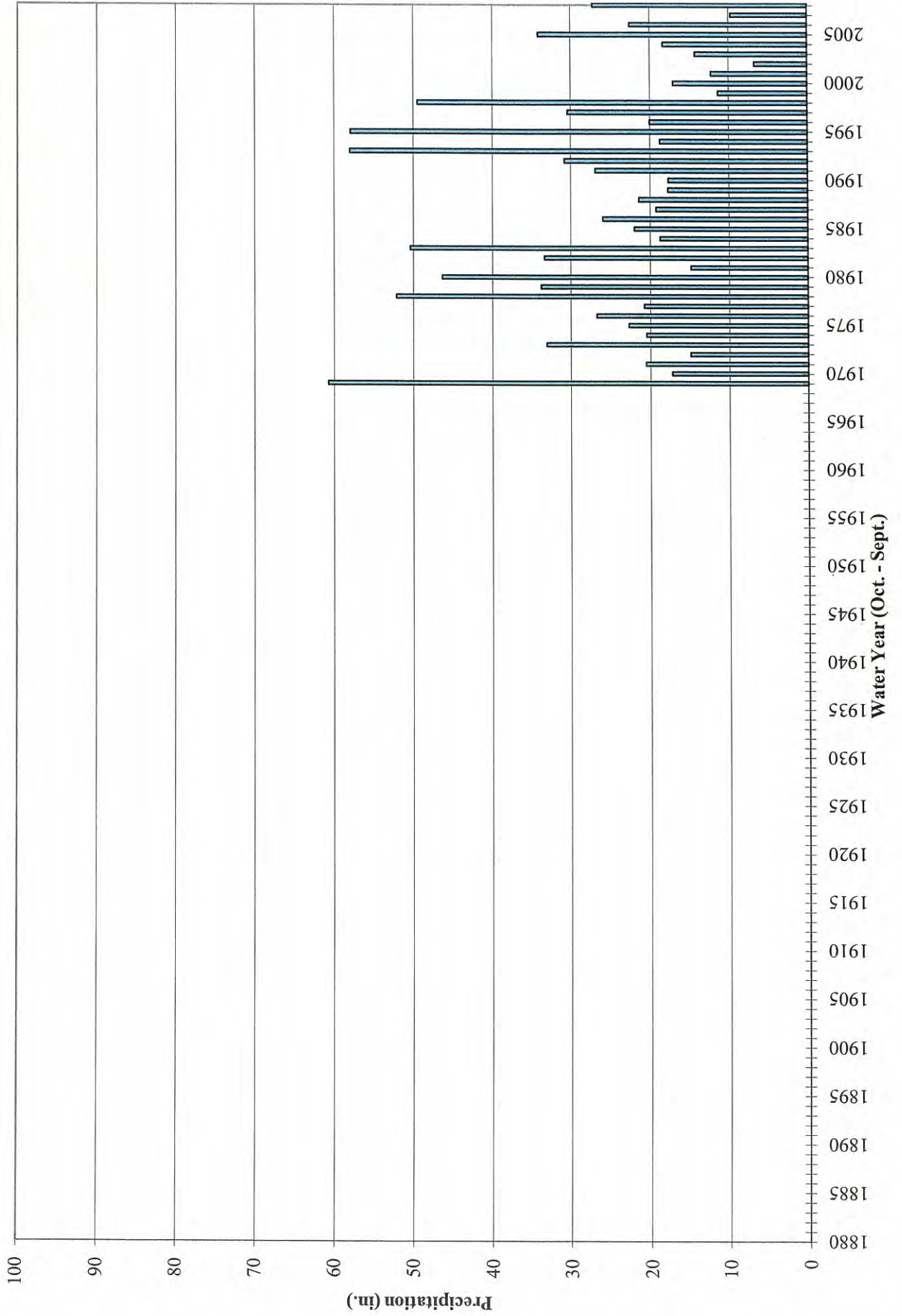
*Lytle Creek Fire Station*



# Historic Annual Precipitation *Mentone CDF*



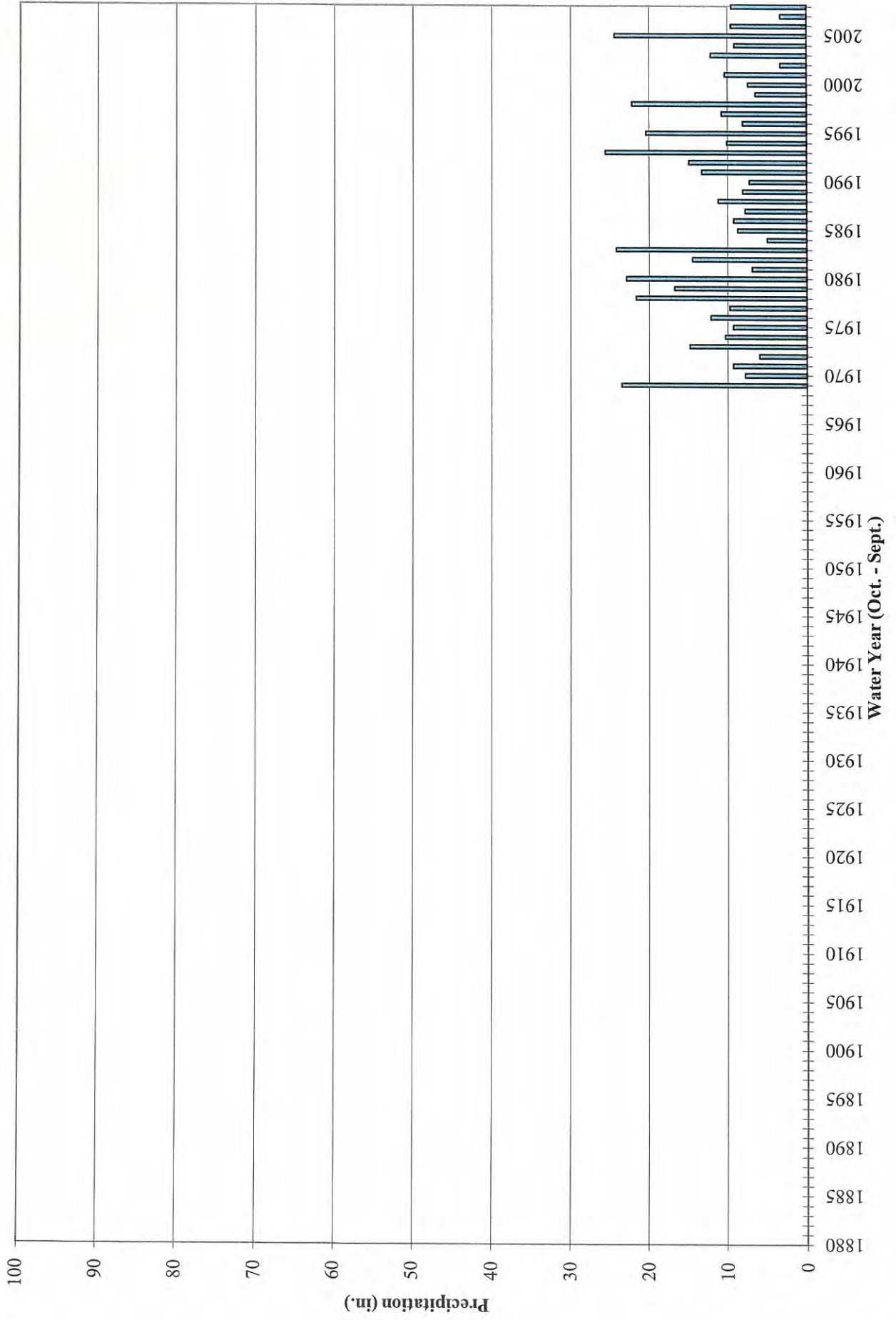
# Historic Annual Precipitation Oak Glen





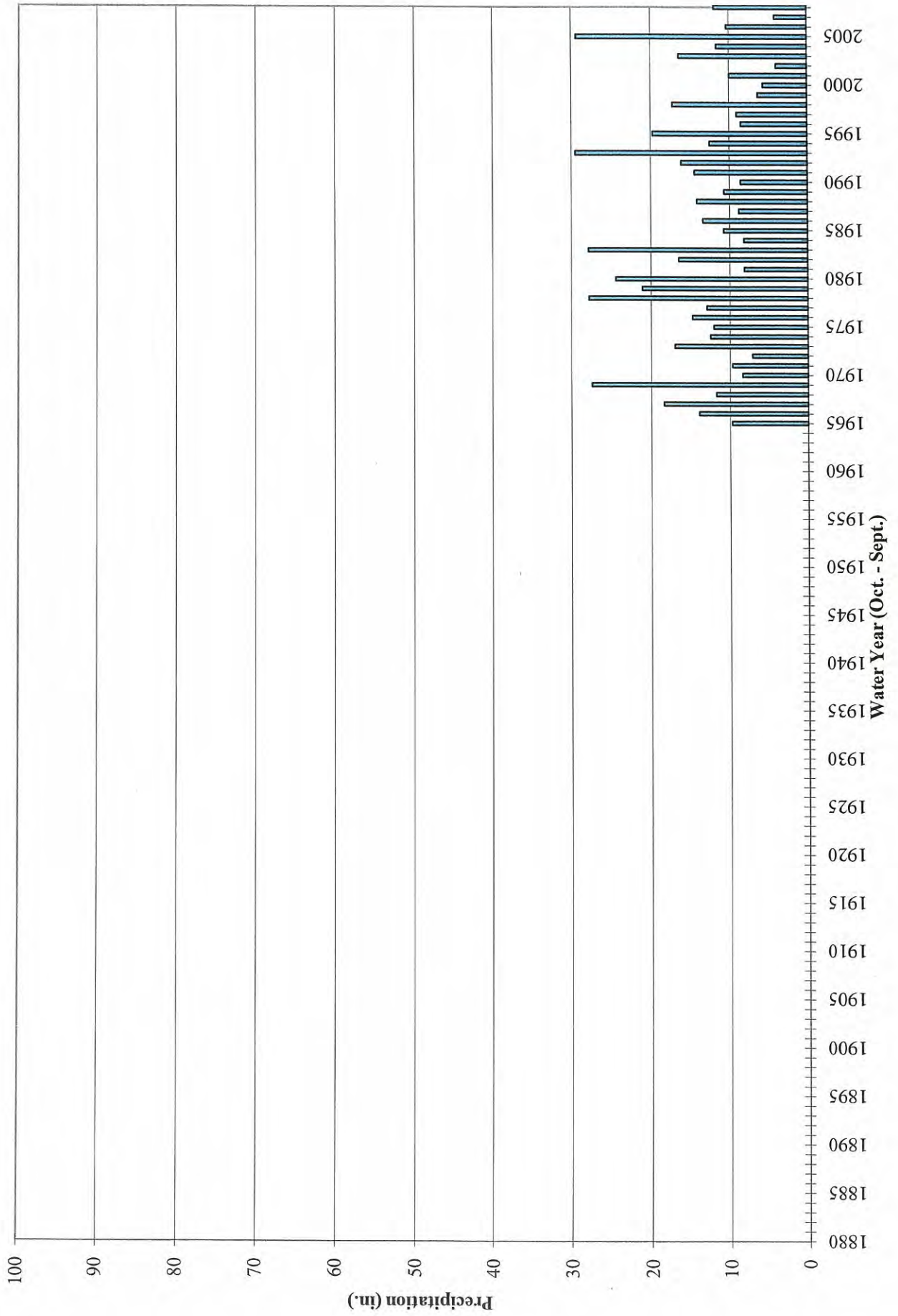
# Historic Annual Precipitation

*Redlands - Roth*



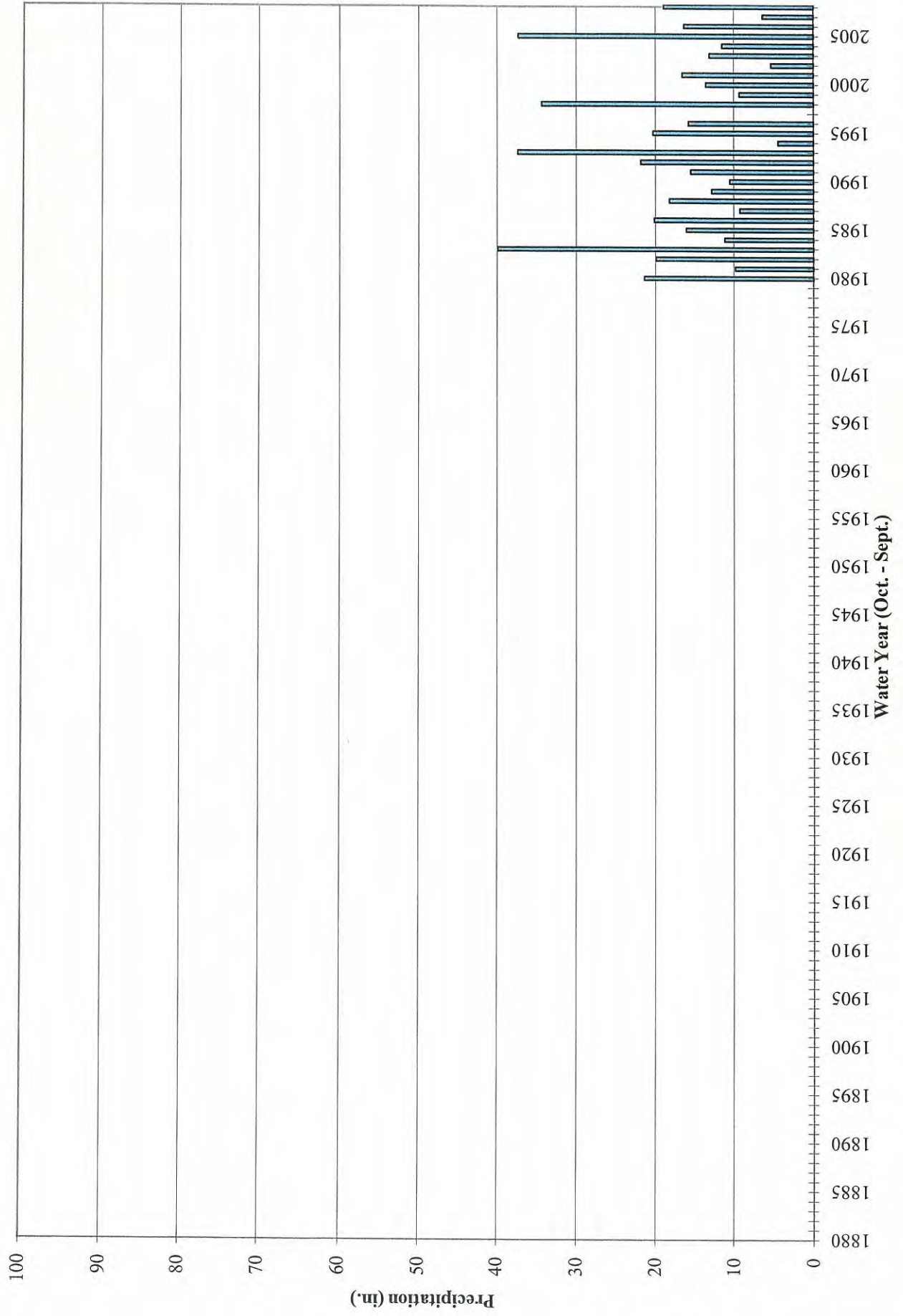
# Historic Annual Precipitation

## Redlands Country Club



# Historic Annual Precipitation

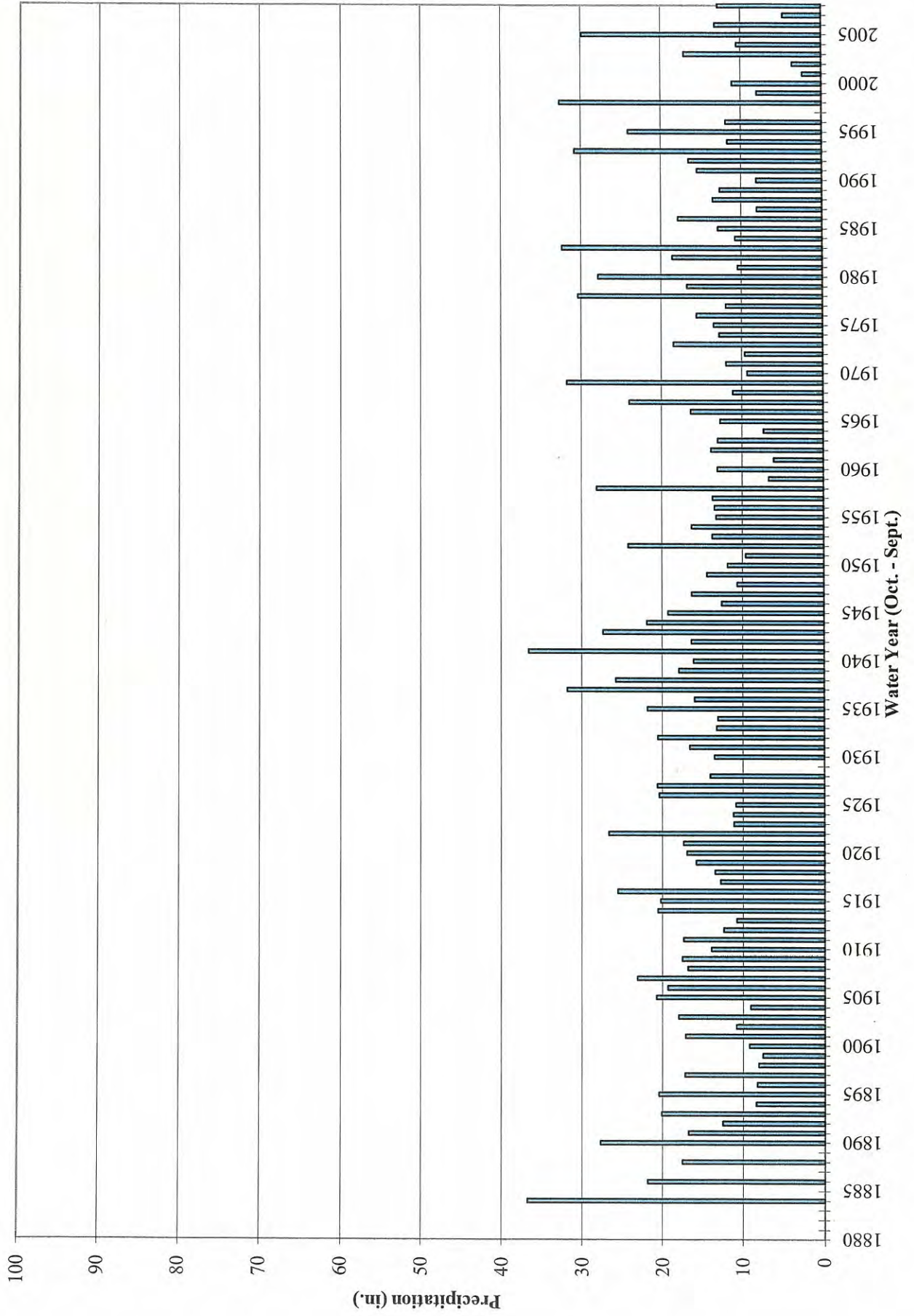
*San Bernardino CDF*





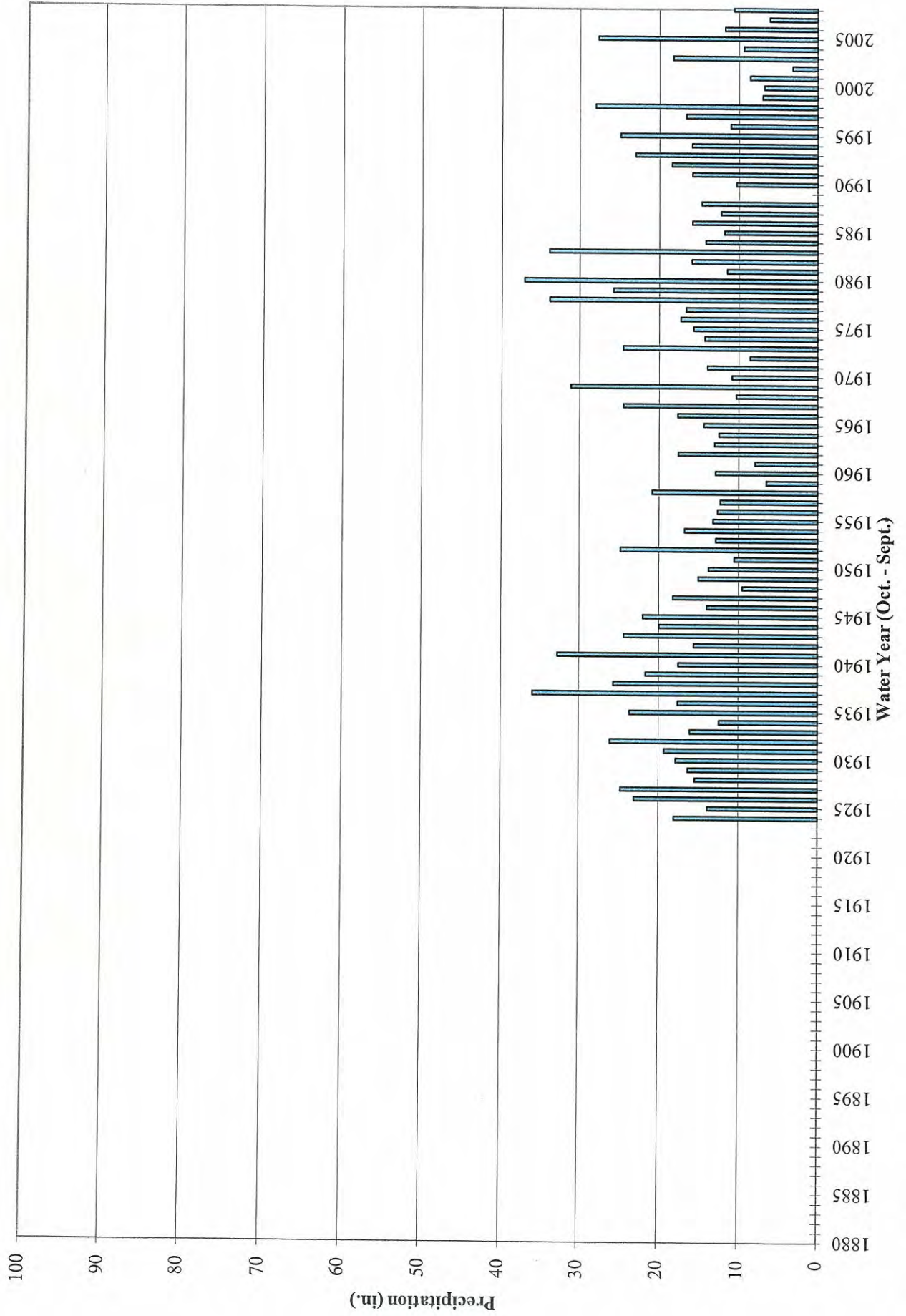
# Historic Annual Precipitation

*San Bernardino County Hospital*



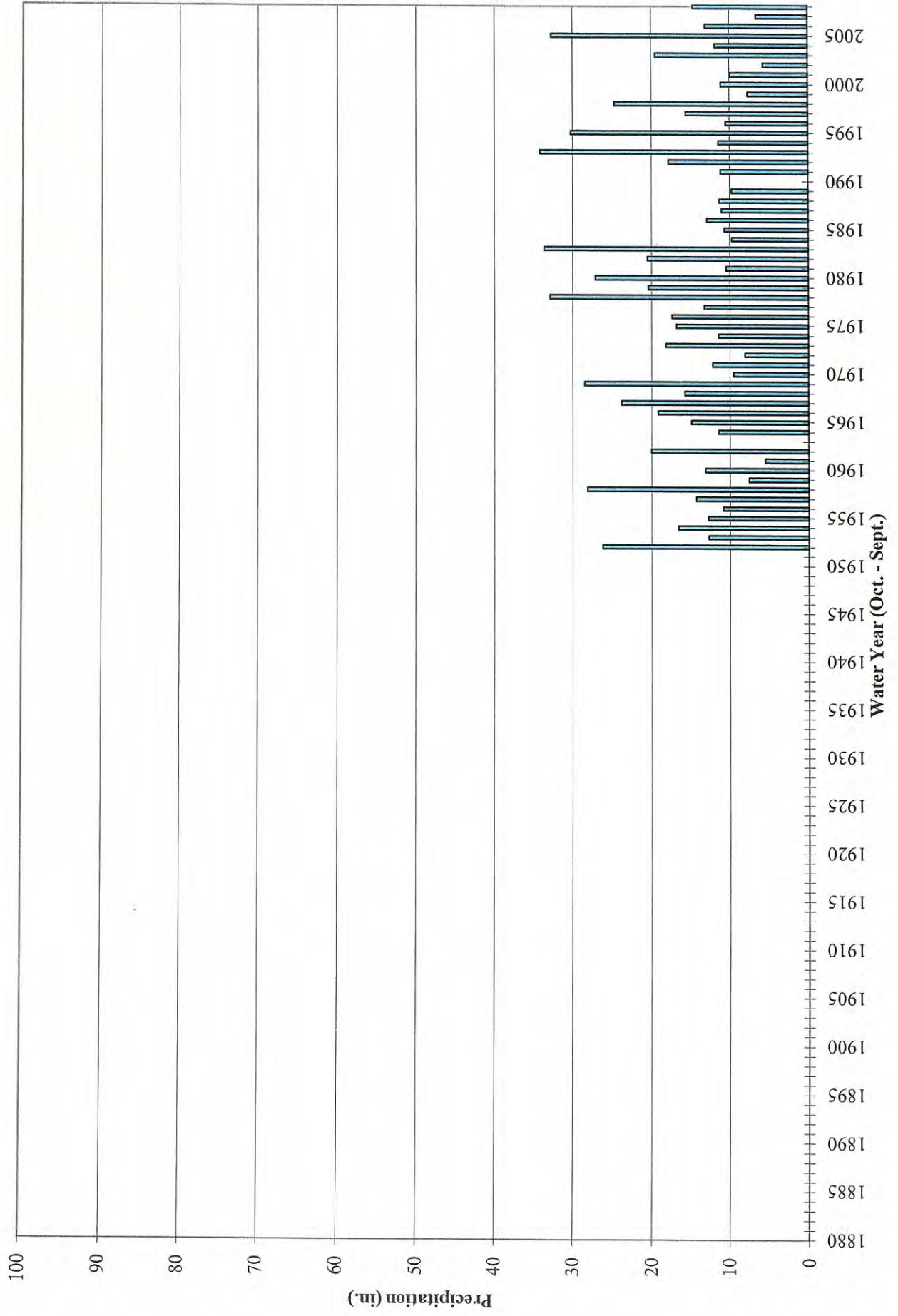
# Historic Annual Precipitation

## Santa Ana Powerhouse #3



# Historic Annual Precipitation

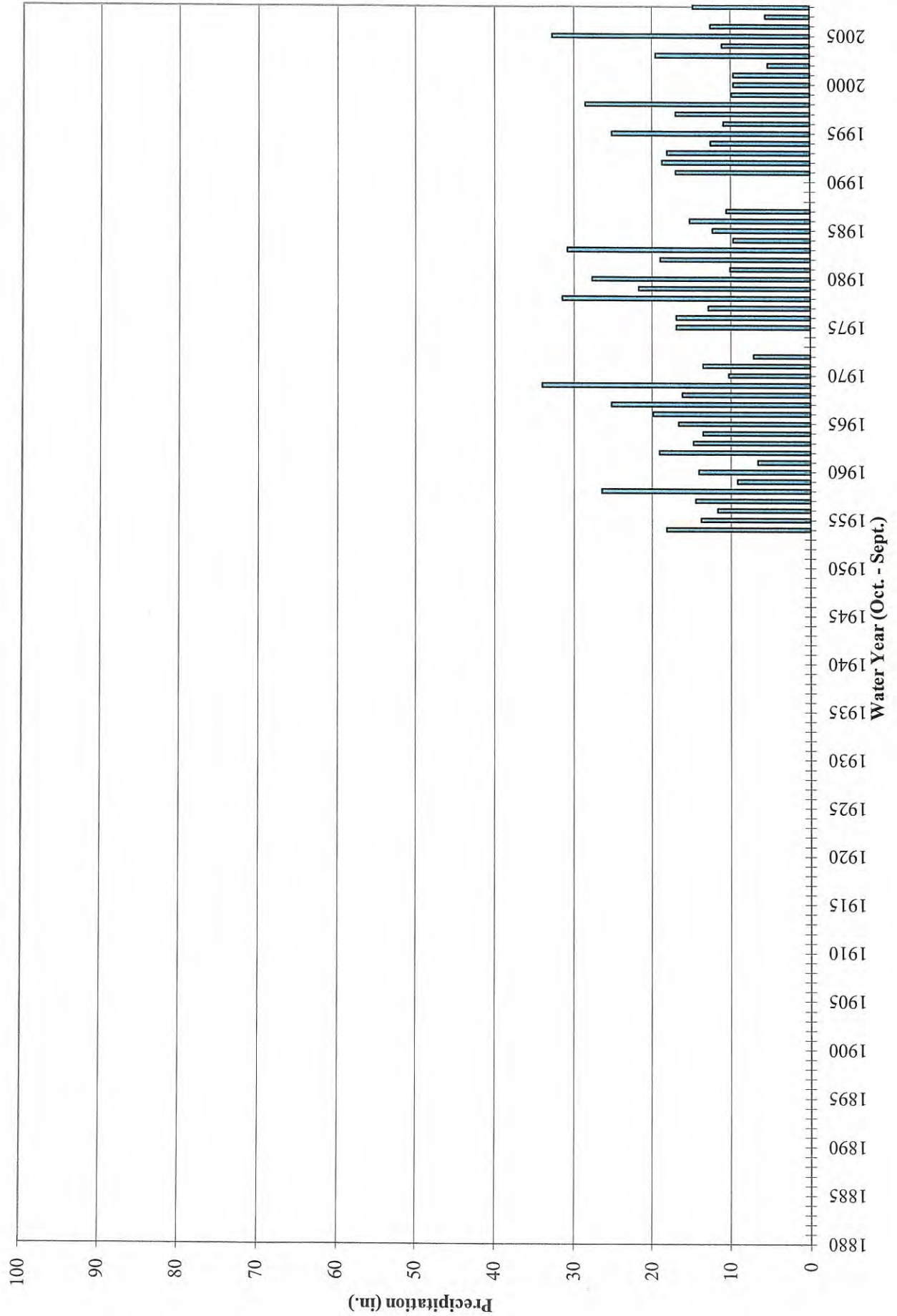
## Yucaipa CDF





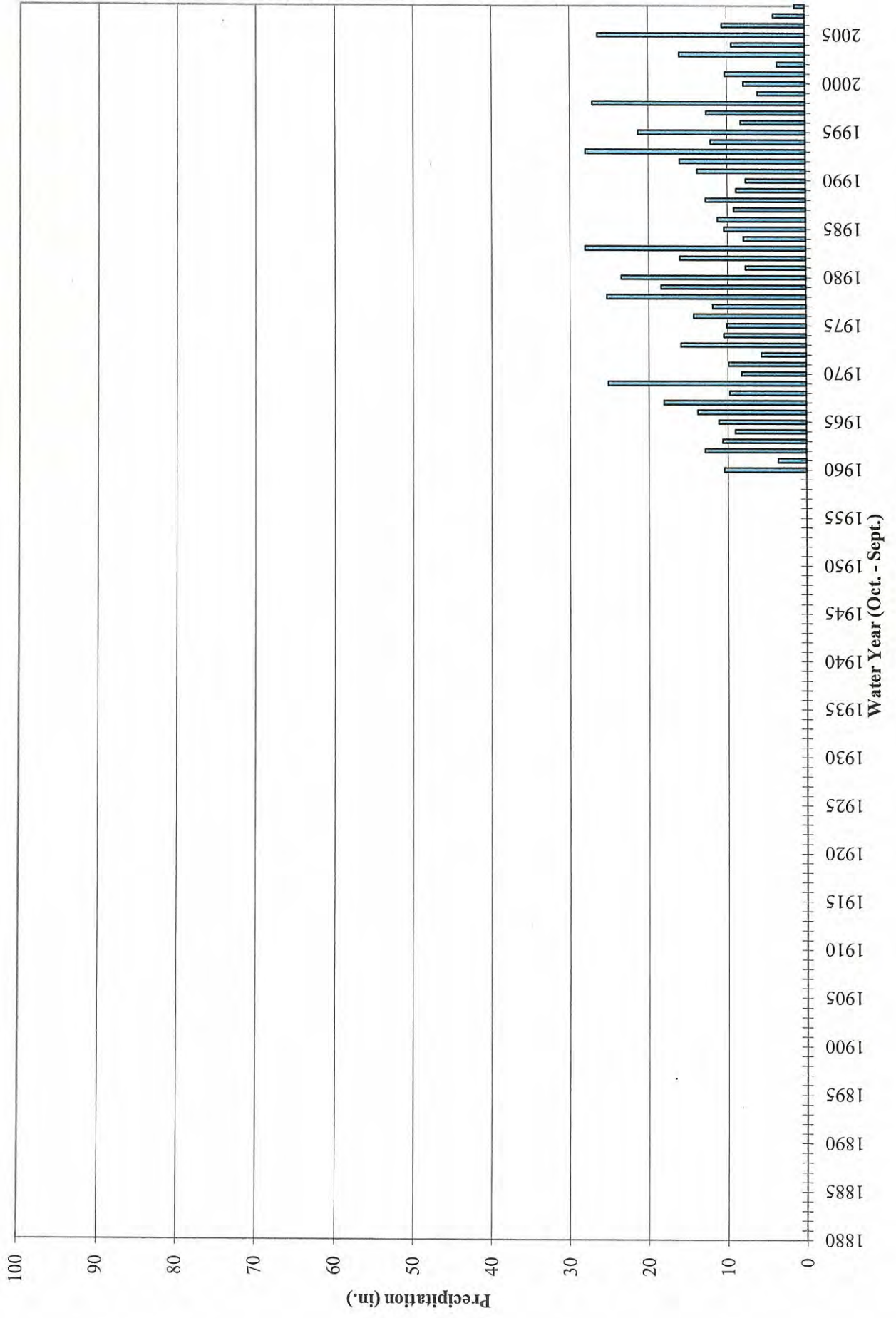
# Historic Annual Precipitation

## Yucaipa Valley Water District



# Historic Annual Precipitation

## Redlands Daily Facts



# Historic Annual Precipitation

*Big Bear City*

