

# **Engineering Investigation of the Bunker Hill Basin 2023-2024**

## **Figures**



**San Bernardino Valley  
Water Conservation District**

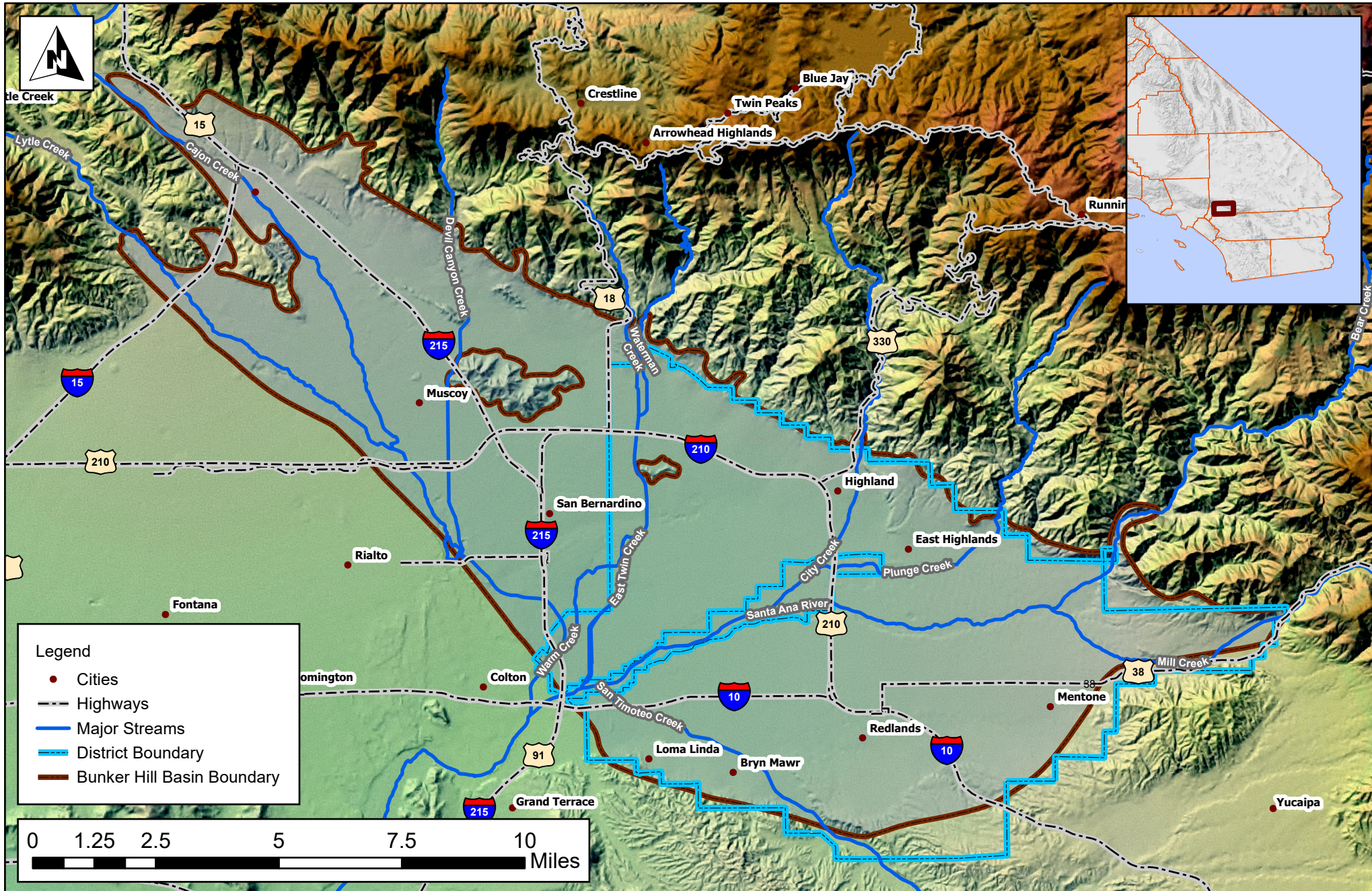
Helping Nature Store Our Water

# Figure 1: Project Area Engineering Investigation Report 2025

Coordinate System:  
 NAD 1983 StatePlane California V FIPS 0405 Feet  
 Projection: Lambert Conformal Conic  
 Datum: North American 1983  
 Source: SBVWCD, CASIL, SBVMWD  
 GIS Contact: A. Frey  
 February 25, 2025



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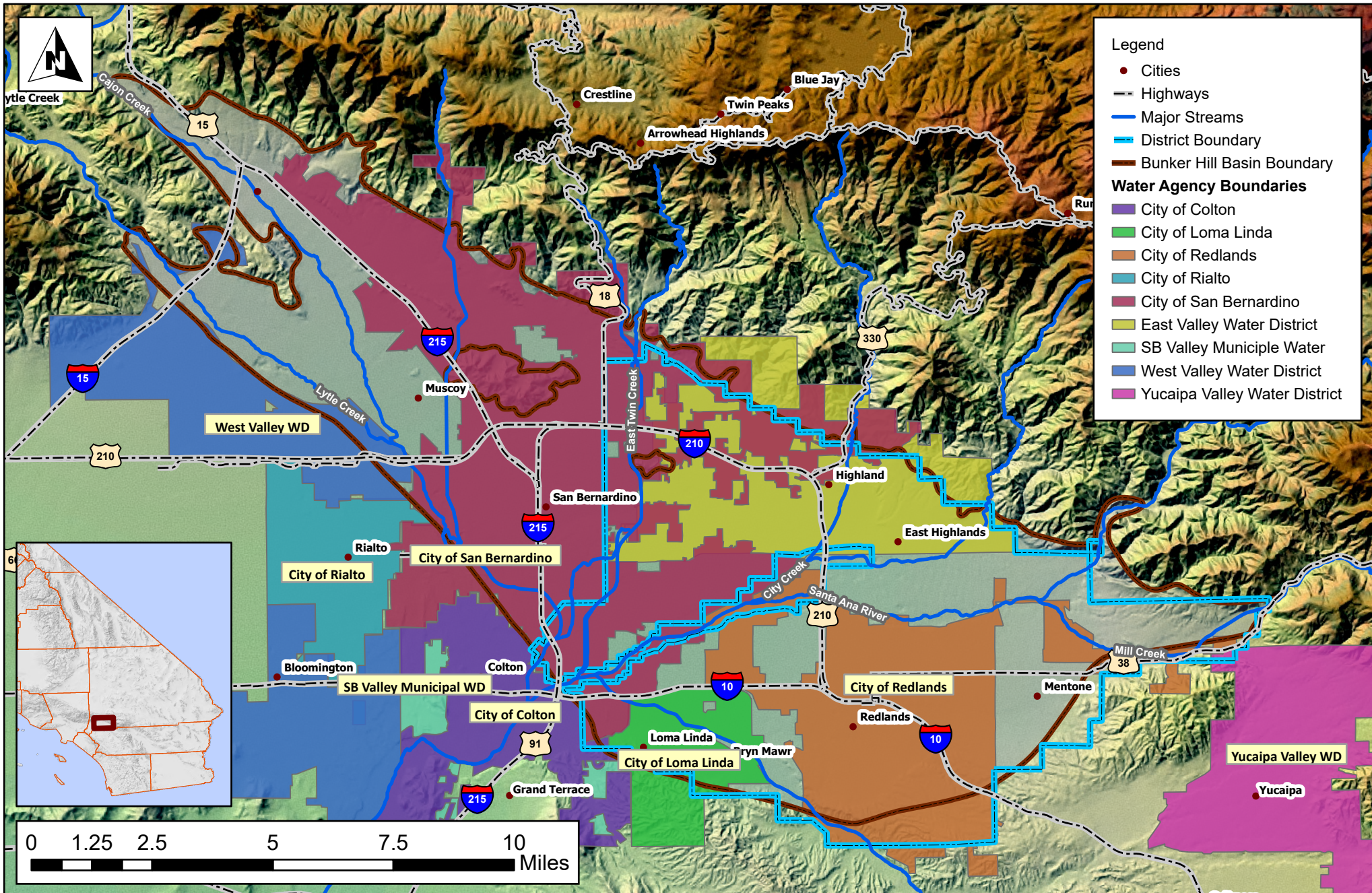


# Figure 2: District and Water Agency Boundaries Engineering Investigation Report 2025

Coordinate System:  
 NAD 1983 StatePlane California V FIPS 0405 Feet  
 Projection: Lambert Conformal Conic  
 Datum: North American 1983  
 Source: SBVWCD, CASIL, SBVMWD  
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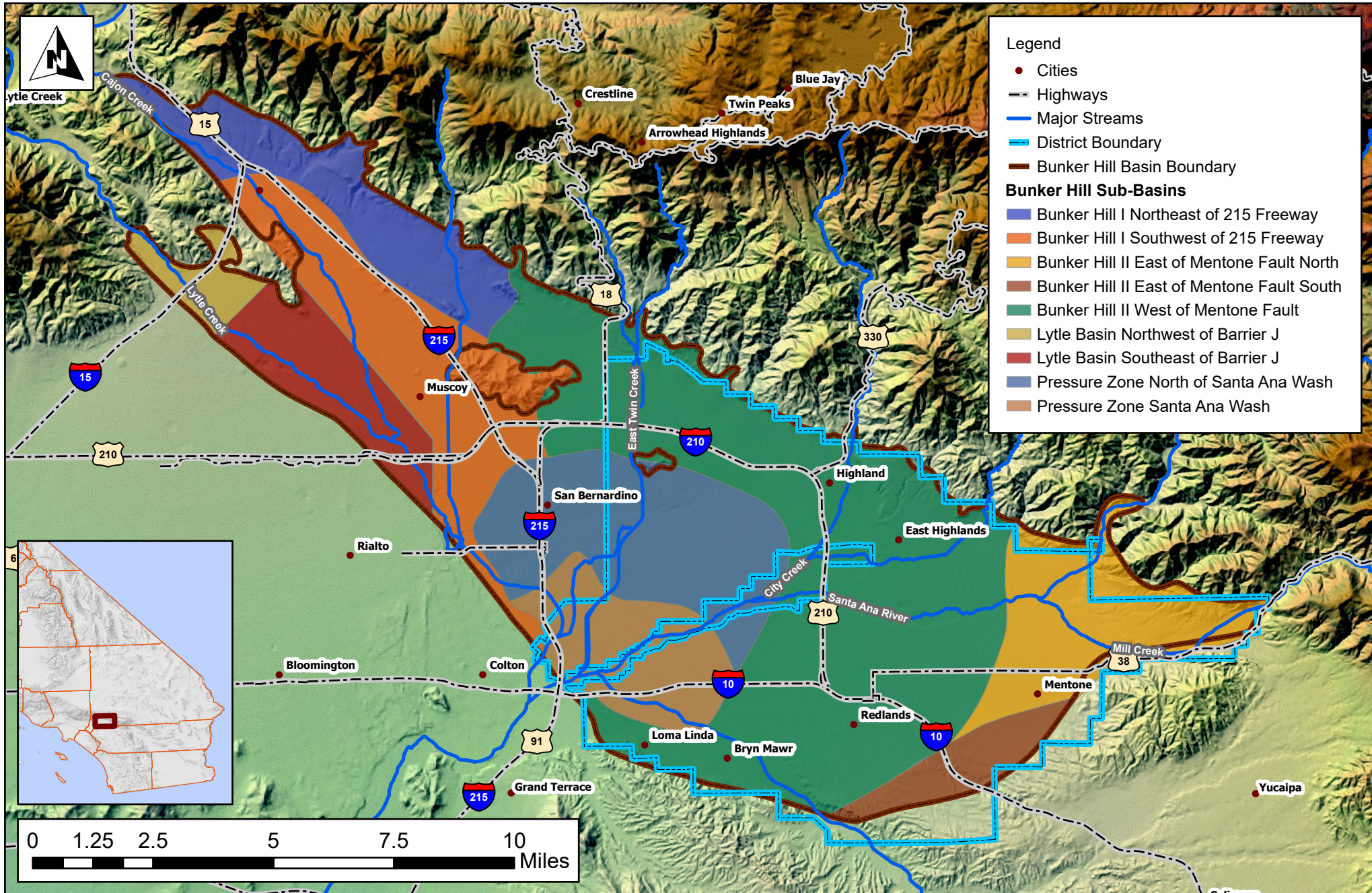


# Figure 3: Bunker Hill Sub Basins Engineering Investigation Report 2025

Coordinate System:  
 NAD 1983 StatePlane California V FIPS 0405 Feet  
 Projection: Lambert Conformal Conic  
 Datum: North American 1983  
 Source: SBVWCD, CASIL, SBVMWD  
 GIS Contact: A. Frey  
 February 25, 2025



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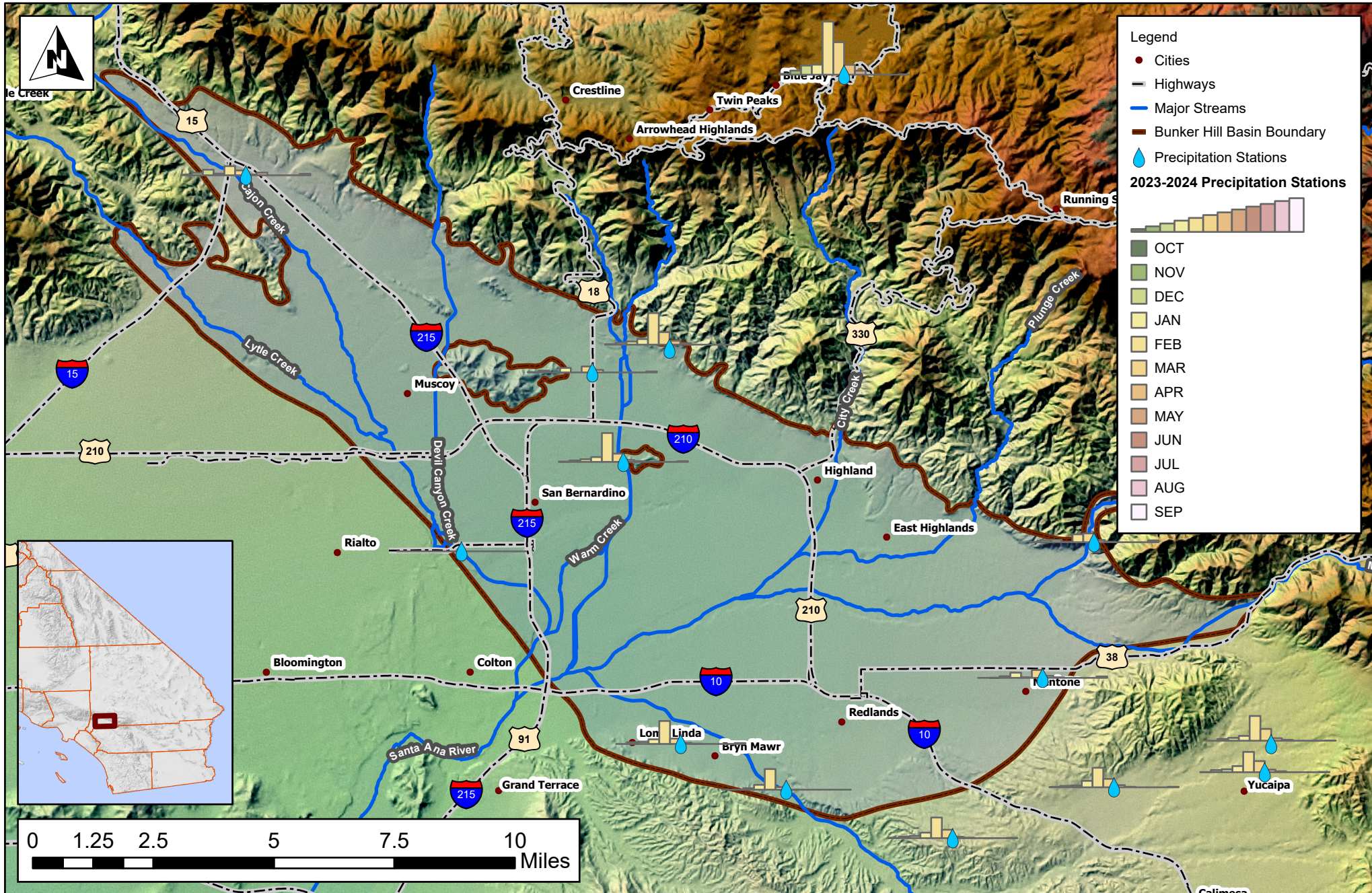


# Figure 4: Precipitation Trends and Station Locations October 2023 - September 2024 Engineering Investigation Report 2025

Coordinate System:  
NAD 1983 StatePlane California V FIPS 0405 Feet  
Projection: Lambert Conformal Conic  
Datum: North American 1983  
Source: SBVWCD, CASIL, SBVMWD  
GIS Contact: A. Frey  
February 25, 2025



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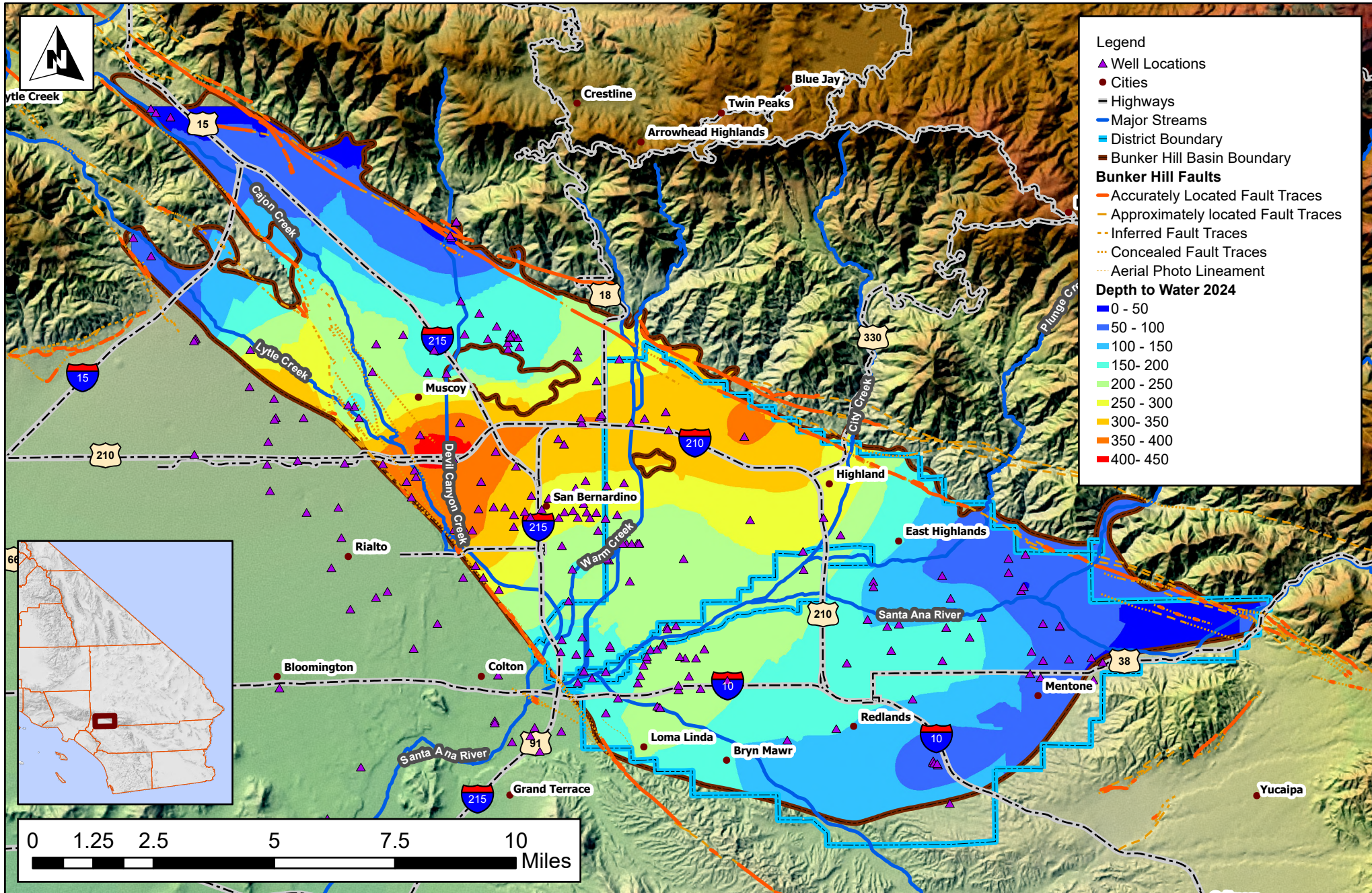


# Figure 6: Water Elevation Contour Surface Fall 2024 Engineering Investigation Report 2025

Coordinate System:  
NAD 1983 StatePlane California V FIPS 0405 Feet  
Projection: Lambert Conformal Conic  
Datum: North American 1983  
Source: SBVWCD, CASIL, SBVMWD  
GIS Contact: A. Frey & A. Olmos  
February 25, 2025



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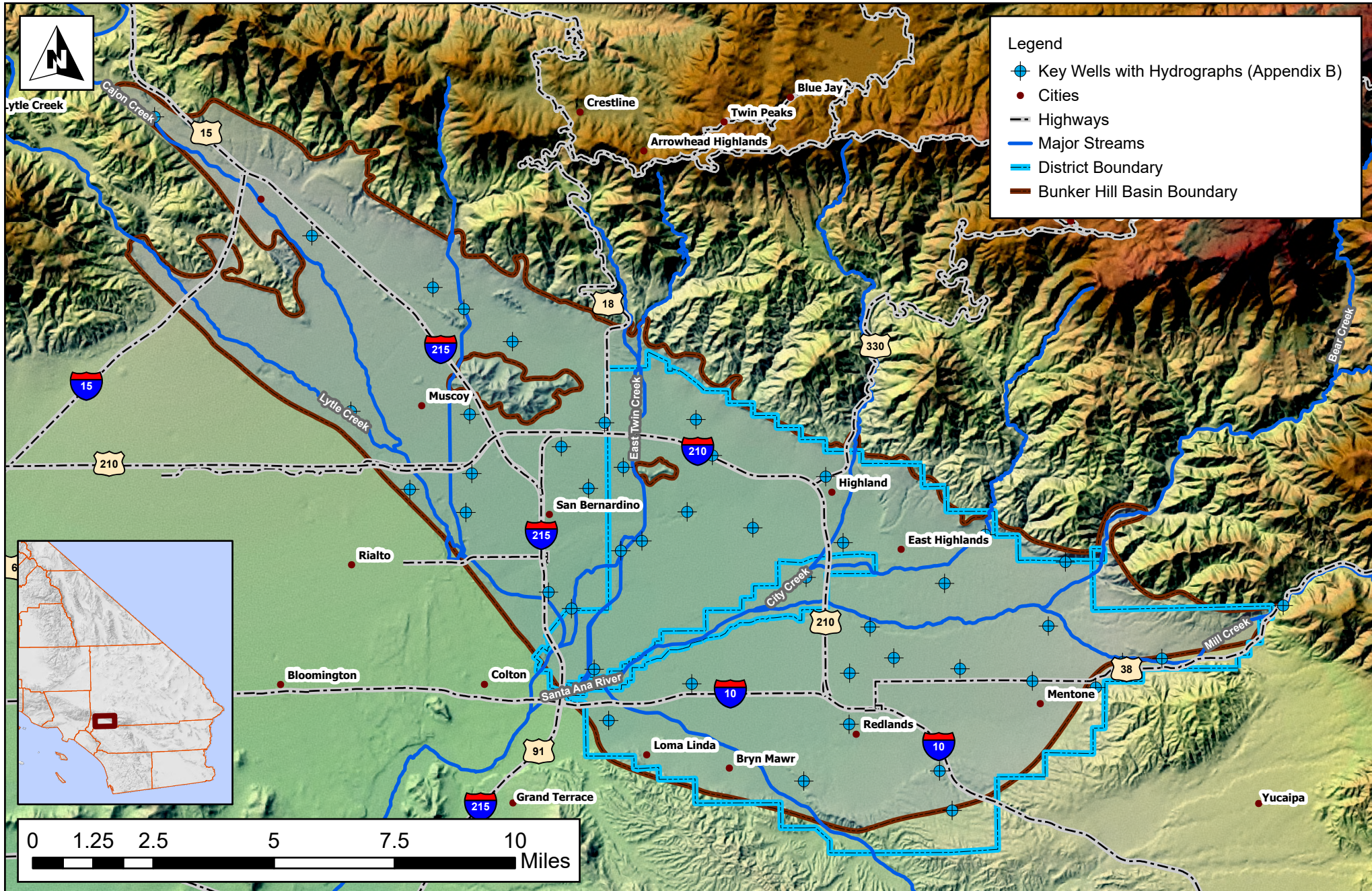


# Figure 7: Key Wells (Appendix B Hydrographs) 2023-2024 Engineering Investigation Report 2025

Coordinate System:  
NAD 1983 StatePlane California V FIPS 0405 Feet  
Projection: Lambert Conformal Conic  
Datum: North American 1983  
Source: SBVMWD, CASIL, SBVMWD  
GIS Contact: Anna Frey  
February 25, 2025



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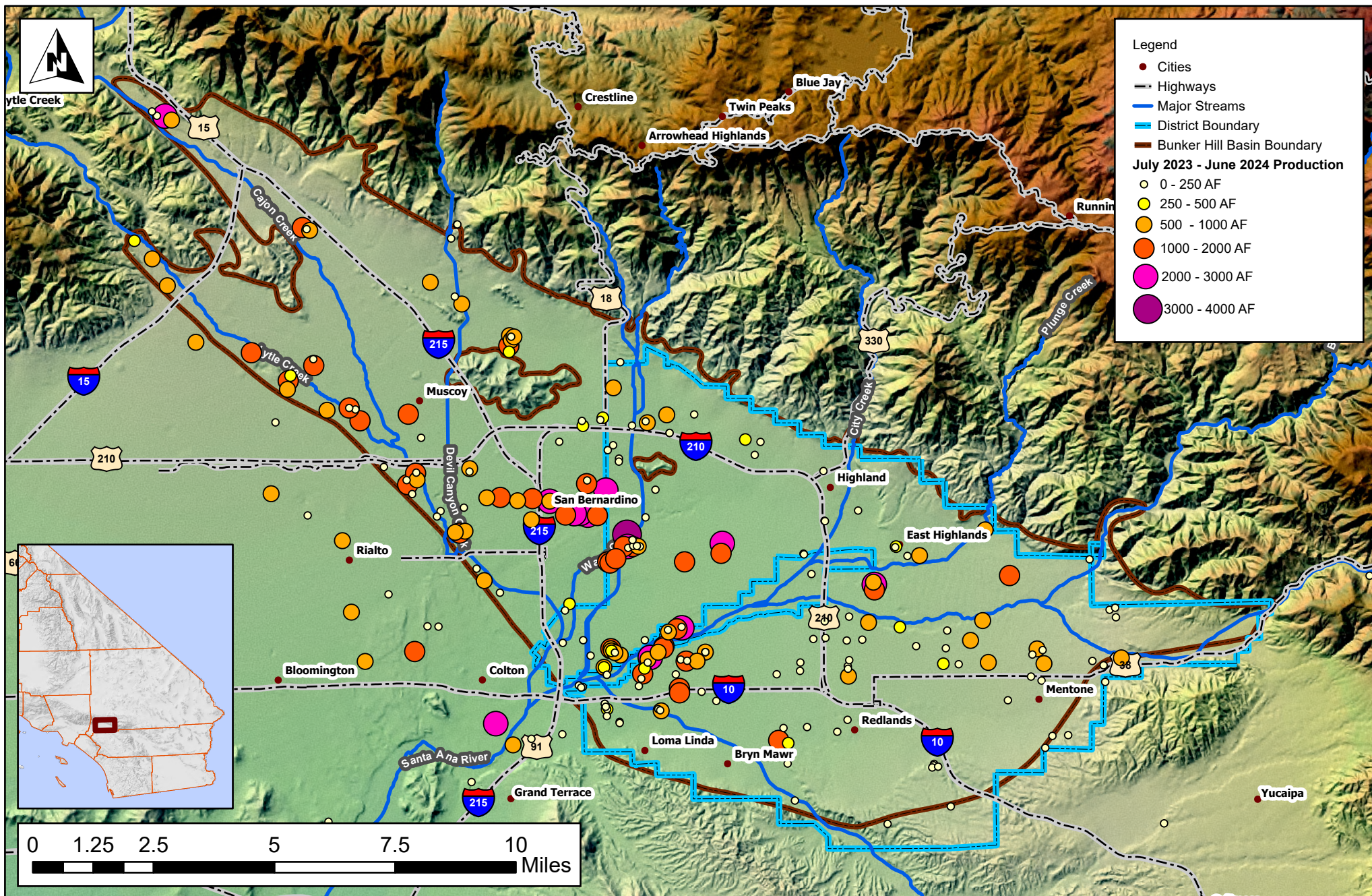


# Figure 8: Groundwater Production Bunker Hill Basin Total Well Production for July 2023 - June 2024 Engineering Investigation Report 2025

Coordinate System:  
NAD 1983 StatePlane California V FIPS 0405 Feet  
Projection: Lambert Conformal Conic  
Datum: North American 1983  
Source: SBVWCD, CASIL, SBVMWD  
GIS Contact: A. Frey  
February 25, 2025

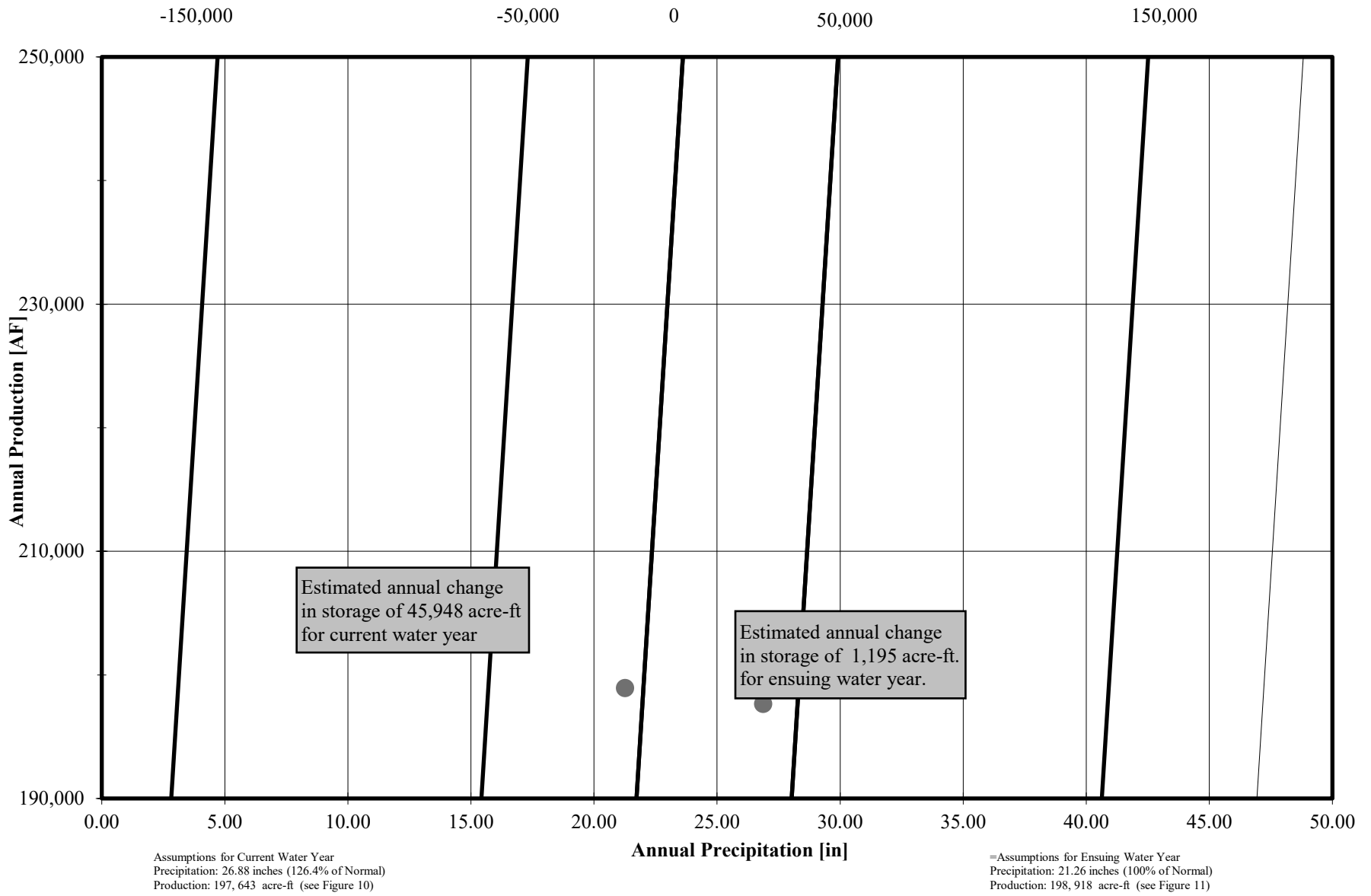


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# Prediction Chart for Annual Change in Storage

## Current and Ensuing Water Years

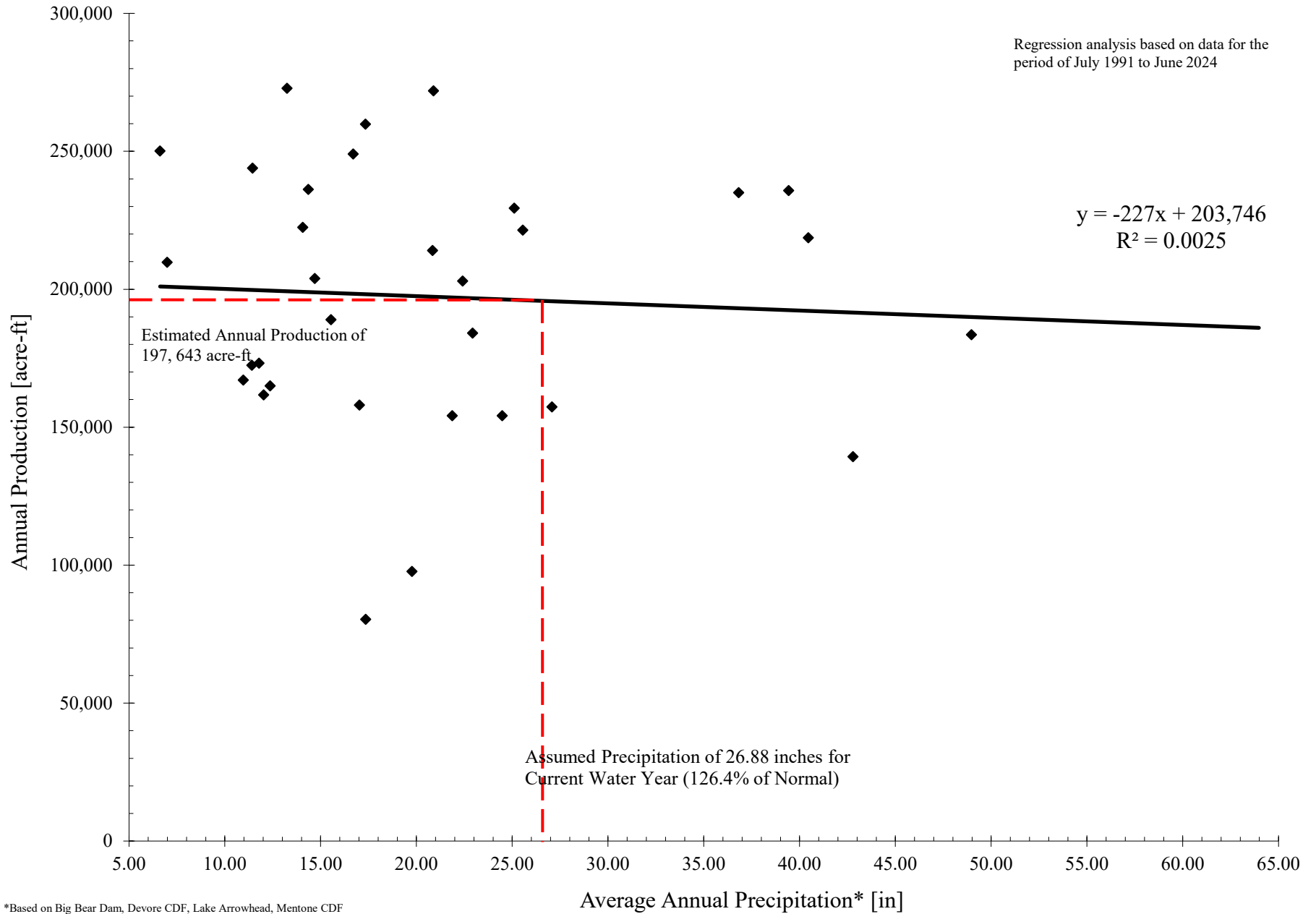


\* Based on Big Bear Dam, Devore CDF, Lake Arrowhead, Mentone CDF  
 Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

$$\text{Change in Storage} = -143,379 + 8357 * \text{Precipitation} - 0.178 * \text{Production} \quad (R^2 = 0.0025)$$

# Estimate of Production for Current Water Year

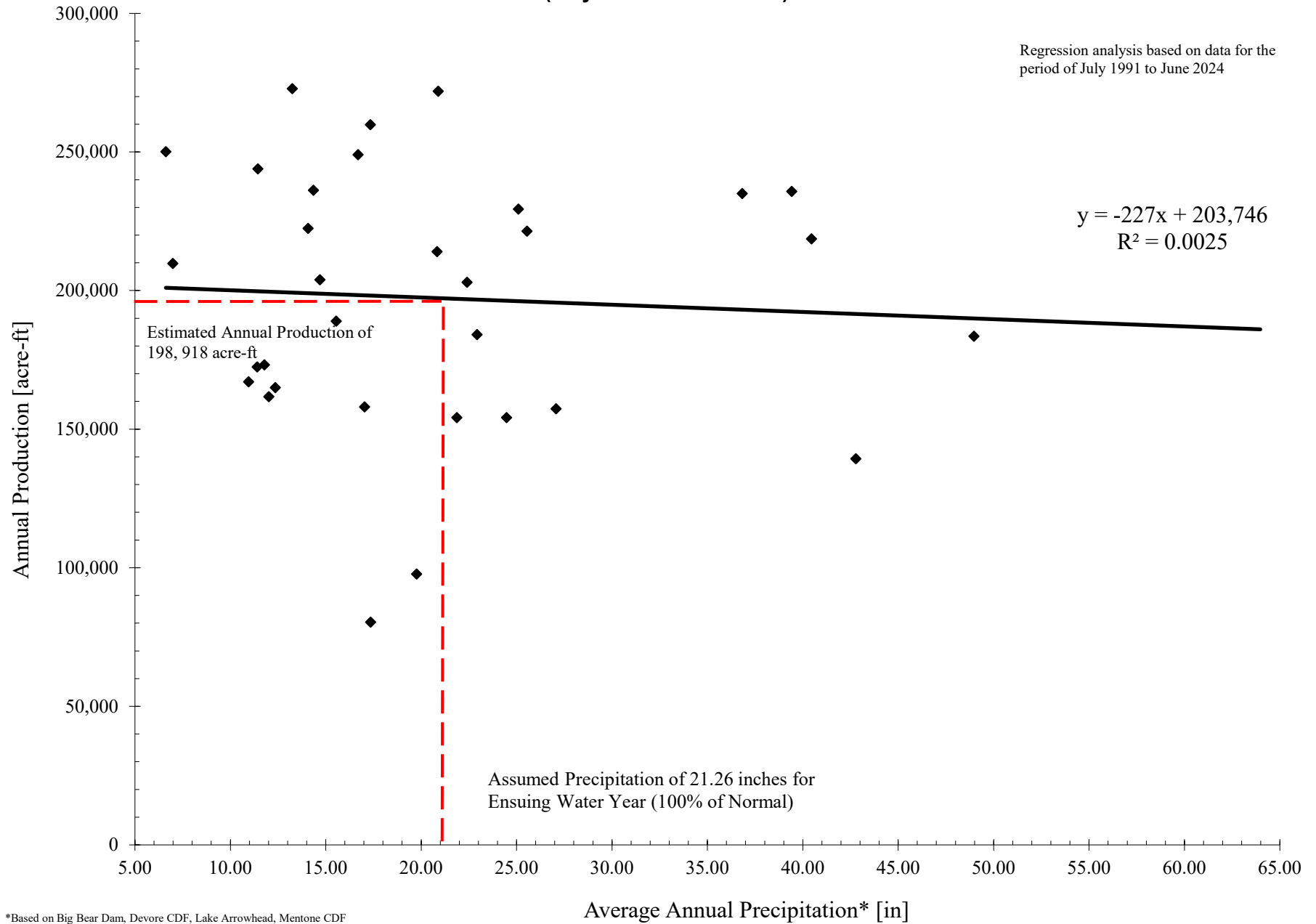
(July 2024 to June 2025)



\*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

(July 2025 to June 2026)



\*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.

# **Engineering Investigation of the Bunker Hill Basin 2023-2024**

## **Tables**



**San Bernardino Valley  
Water Conservation District**

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## Summary of Percentage of Normal Precipitation

1993  
to 2024  
(Water Year - Oct. to Sept.)

Station	Historic Annual Avg. [in]	1993 -1994 [in]	1994 -1995 [in]	1995 -1996 [in]	1996 -1997 [in]	1997 -1998 [in]	1998 -1999 [in]	1999 -2000 [in]	2000 -2001 [in]	2001 -2002 [in]	2002 -2003 [in]	2003 -2004 [in]	2004 -2005 [in]	2005 -2006 [in]	2006 -2007 [in]	2007 -2008 [in]	2008 -2009 [in]	2009-2010 [in]	2010 -2011 [in]	2011 -2012 [in]	2012 -2013 [in]	2013 -2014 [in]	2014 -2015 [in]	2015 -2016 [in]	2016 -2017 [in]	2017 -2018 [in]	2018 -2019 [in]	2019 -2020 [in]	2020 -2021 [in]	2021 -2022 [in]	2022 -2023 [in]	2023 -2024 [in]	Each Station 30 Yr. Avg. [in.]
Big Bear City	14.44	10.28	19.41	13.28	11.59	20.64	7.42	5.15	0.01	0.00	0.00	0.00	0.00	0.00	10.21	14.62	19.55	25.33	16.27	10.46	8.54	9.28	11.18	21.09	7.79	23.37	7.73	8.89	19.09	23.2	-	10.81	
Big Bear Dam	34.03	27.60	52.40	24.40	18.60	54.30	14.20	20.60	21.40	9.20	38.10	19.60	59.10	26.40	10.30	23.10	19.70	26.00	20.20	10.44	5.19	11.72	20.40	17.32	19.88	31.27	50.19	45.73	20.21	43.89	85.84	43.29	28.73
Camp Angelus	26.40	17.20	46.70	26.00	30.50	55.30	16.10	21.10	21.51	7.70	35.40	13.20	35.20	41.90	0.00	2.70	18.00	18.80	1.70	16.82	9.03	10.62	41.01	11.22	36.29	16.45	45.56	27.92	12.80	24.20	148.50	0.00	26.11
Crafton Hills	13.92	11.26	27.22	9.13	16.67	25.55	7.29	6.40	10.49	2.46	17.57	9.47	31.39	11.45	3.34	13.34	9.90	17.80	24.52	9.57	9.69	6.55	13.06	10.56	19.12	6.27	18.26	17.32	7.81	10.3	23.4	17.04	13.68
Del Rosa Ranger Station	17.69	12.30	27.69	14.21	17.31	37.26	8.30	12.73	16.60	6.09	19.69	13.02	38.55	17.40	8.77	17.80	13.61	22.01	30.84	11.68	2.22	4.54	6.75	6.32	24.37	9.06	27.381	15.87	10.35	16.21	36.99	24.95	17.12
Devore CDF	26.28	19.66	39.77	23.96	33.10	52.69	13.61	8.04	15.52	10.90	35.35	16.44	60.36	24.80	8.86	25.22	16.51	34.12	43.20	17.47	14.50	13.81	18.14	15.29	35.05	12.21	39.471	22.03	8.35	20.29	54.43	12.10	24.69
Fallsvale	32.07	52.00	54.90	22.10	33.80	53.00	16.30	19.20	15.30	6.50	37.50	19.80	59.70	26.90	11.10	29.30	25.00	2.85	29.51	22.90	14.10	26.30	25.58	22.314	47.64	20.77	48.7	39.96	15.39	35.24	59.79	54.702	30.59
Lake Arrowhead	37.47	10.04	62.60	32.70	36.50	72.80	18.10	25.80	28.60	10.70	36.50	22.70	66.40	29.50	13.60	40.40	30.30	46.00	37.76	25.10	21.30	26.70	14.73	24.3	48.81	17.27	50.816	40.3	29.07	46.64	102.73	51.1	36.12
Loma Linda FD	11.05	10.81	21.17	8.65	9.78	22.74	5.12	7.74	6.38	2.45	14.48	8.06	22.59	11.06	3.51	9.64	8.95	13.10	18.24	6.79	6.42	9.06	9.50	7.86	16.13	5.91	17.36	15.17	7.16	8	20.48	16.14	11.30
Lytle Creek at Foothill	12.98	9.16	25.51	12.23	13.83	25.84	6.25	9.81	12.12	4.00	13.60	7.16	27.23	11.22	3.84	11.89	8.12	13.03	21.63	6.90	4.51	8.34	10.18	7.04	18.247	4.99	15.32	10.79	6.68	10.04	19.74	-	11.97
Lytle Creek Fire Station	22.33	20.50	47.57	24.49	23.10	52.18	11.81	20.40	18.34	4.47	16.96	12.09	44.11	18.92	4.22	21.89	3.32	0.00	28.46	8.18	7.33	8.03	9.07	13.57	31.02	11.902	36.02	24.46	6.77	16.88	46.43	5.15	19.28
Mentone CDF	12.12	11.68	23.25	9.42	15.50	27.09	4.28	9.08	10.16	4.06	15.00	10.38	24.94	11.01	5.41	10.76	9.39	14.96	17.77	7.90	7.33	3.11	0.89	8.57	15.14	5.28	16.22	14.37	7.01	6.86	4.82	8.05	10.96
Oak Glen	23.89	18.76	57.92	20.04	30.39	49.46	11.32	17.12	11.24	6.72	14.28	18.39	34.14	22.58	9.71	27.54	18.11	29.72	36.82	15.13	15.69	14.07	20.54	18.78	16.04	7.44	34.06	23.05	8.88	15.01	35.45	20.91	21.91
Redlands - Roth	11.35	10.06	20.49	8.08	10.77	22.29	6.46	7.41	10.38	3.35	12.18	9.16	24.43	9.52	3.31	9.46	8.91	15.12	17.38	4.34	1.54	2.08	2.72	1.7	14.42	5.43	14.74	13.776	6.63	6.07	19.53	12.26	10.13
Redlands Country Club	12.28	11.90	15.76	0.65	9.03	17.22	6.30	5.68	9.96	3.97	16.45	11.58	29.37	10.30	4.13	11.93	11.35	17.25	22.33	8.84	8.82	6.92	10.37	8.61	16.9	5.53	16.12	6.27	6.23	8.64	22.12	16.89	11.53
San Bernardino CDF	16.03	4.46	20.29	15.77	16.17	34.32	9.30	13.62	16.61	5.29	13.14	11.54	37.28	16.39	6.33	18.91	10.73	20.45	27.94	10.63	7.69	11.30	11.19	10.91	23.3	7.99	23.48	13.65	8.88	4.62	21.58	6.69	14.85
San Bernardino Co. Hospital	16.04	12.40	25.94	11.94	17.80	32.67	8.02	11.09	2.43	3.60	17.06	10.49	29.89	13.20	4.68	12.81	9.96	17.03	21.76	9.58	9.36	10.97	10.97	8.96	19.15	6.67	5.7	13.18	12.84	11.41	23.58	20.44	13.73
Santa Ana Pumphouse #3	15.90	14.00	24.85	11.05	16.60	27.95	7.01	6.78	8.63	3.23	18.24	9.40	27.65	11.78	6.13	10.73	9.75	14.58	20.18	8.62	9.12	7.42	9.57	9.29	16.47	6.762	20.07	14.98	8.62	5.94	19.13	10.79	12.75
Yucaipa CDF	15.29	10.00	14.70	10.89	16.06	24.70	7.63	11.10	9.92	5.66	19.47	11.84	32.70	13.14	6.56	14.67	12.11	18.79	25.09	11.80	5.25	4.45	12.49	11.11	17.18	6.47	20.341	14.7	6.06	9.99	29.63	20.56	14.03
Yucaipa Valley Water District	15.27	11.35	28.54	10.19	16.93	28.60	9.87	9.63	9.65	5.27	19.50	11.10	32.73	12.52	5.53	14.79	10.47	17.68	22.74	10.80	9.60	7.58	12.39	10.31	18.38	6.48	19.73	16.53	5.14	9.71	24.58	19.15	14.43
<b>Percent of Normal</b>	<b>100%</b>	<b>79%</b>	<b>170%</b>	<b>80%</b>	<b>102%</b>	<b>190%</b>	<b>50%</b>	<b>64%</b>	<b>66%</b>	<b>27%</b>	<b>106%</b>	<b>63%</b>	<b>186%</b>	<b>88%</b>	<b>31%</b>	<b>87%</b>	<b>69%</b>	<b>98%</b>	<b>128%</b>	<b>62%</b>	<b>46%</b>	<b>52%</b>	<b>69%</b>	<b>61%</b>	<b>123%</b>	<b>52%</b>	<b>140%</b>	<b>103%</b>	<b>53%</b>	<b>85%</b>	<b>212%</b>	<b>103%</b>	<b>92%</b>

<b>Total Station Average</b>	<b>19.34</b>
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Source: San Bernardino County Department of Transportation/Flood Control

## Change in Groundwater Levels in Key Wells

Fall 2023 to Fall 2024

WCD Code	Recordation Number	State Well Number	Well Name	Owner Or Measuring Agency	2023 Depth To Water (ft)	2024 Depth To Water (ft)	Difference Fall 2023 to Fall 2024
1865	3601675	1N4W25A01S	27	East Valley Water District	189.0	189.0	0.0
1984	3602113	1N3W30N01S	41	East Valley Water District	308.0	231.0	77.0
1364	3600026	1S3W04J01S	102	East Valley Water District	260.0	243.0	17.0
1401	3600220	1S3W01H01S	142 Mt. Harrison	East Valley Water District	150.0	106.0	44.0
1660	3601184	1N3W33F01S	94 Corwin	East Valley Water District	418	424.0	-6.0
1851	3601660	1S3W06H04S	9A	East Valley Water District	262.0	256.0	6.0
1010	9900021	1S3W09E02S	Tri-City Concrete	East Valley Water District	254.0	245.0	9.0
2271	3602855	1S4W25D07S	Anderson III	Loma Linda University	237	240.0	-3.0
1727	3601308	1S2W19K01S	Agate #1	Redlands, City of	71.0	74.0	-3.0
1708	3601283	1S2W22C02S	E. Lugonia #2	Redlands, City of			
1712	3601287	1S2W21B02S	E. Lugonia #3	Redlands, City of	23.0	29.0	-6.0
1714	3601290	1S2W21D01S	E. Lugonia #6	Redlands, City of	23.0	51.0	-28.0
1970	3602065	1S3W32J02S	Lee Well	Redlands, City of			
1706	3601281	1S2W36F01S	Maguet #1	Redlands, City of	15.0	20.0	-5.0
1709	3601284	1S2W21E01S	Maguet #2	Redlands, City of	36.0	44.0	-8.0
1707	3601282	1S1W08H01S	Mill Creek #1	Redlands, City of			
1819	3601586	1S3W15F01S	Orange Street	Redlands, City of	164.0	131.0	33.0
1591	3600918	2S3W01E01S	Redlands Heights	Redlands, City of	184.0	177.0	7.0
1718	3601294	1S3W35G09S	Well #13	Redlands, City of	61.0	64.0	-3.0
1720	3601296	1S3W35H03S	Well #16	Redlands, City of	43.0	44.0	-1.0
1722	3601298	1S3W21H01S	Well #32	Redlands, City of			
1723	3601299	1S4W24K01S	Well #34	Redlands, City of	256.0	236.0	20.0
1964	3602032	1S3W22A02S	Well #35	Redlands, City of	234.0	189.0	45.0
1725	3601301	1S3W28H01S	Well #41	Redlands, City of			
1702	3601263	1N5W23Q01S	City 1	Rialto, City of	247.0	392.0	-145.0
1668	3601225	1S4W02P02S	Cooley D	Riverside, City of	235.1	234.1	1.0
1662	3601218	1S4W14P02S	Raub 1	Riverside, City of			
1677	3601234	1S4W27A19S	Stewart 19	Riverside, City of			
1744	3601431	1S4W27H01S	Stewart 20	Riverside, City of	190.5	192.0	-1.4
1767	3601478	1S4W22B03S	Thorn 10	Riverside, City of			
1683	3601240	1S4W22H04S	Warren 1	Riverside, City of		172.5	
1554	3600787	1S4W23A02S	26-1	Riverside, City Of-Gage Canal	198.0	199.0	-1.0
2291	229101	1S2W07B01S	SBVWCD #1	San Bernardino Valley Water Cons. Dis	96.5	77.4	19.2
2290	229001	1S2W07K01S	SBVWCD #2	San Bernardino Valley Water Cons. Dis	29.8	18.4	11.4
2286	228601	1S3W12J01S	SBVWCD #3	San Bernardino Valley Water Cons. Dis	68.3	23.8	44.6
2288	228801	1S3W11H01S	SBVWCD #4	San Bernardino Valley Water Cons. Dis	109.0	82.3	26.7
1525	3600725	1N4W34G01S	17th & Sierra Way #2	San Bernardino, City of			
1517		1N4W32D03S	19th Street No. 1	San Bernardino, City of	392.0		
1520	3600720	1N4W27M02S	27th Street Well	San Bernardino, City of	323.8	332.2	-8.4
1519	3600719	1N4W27G01S	30th & Mtn. View	San Bernardino, City of	388.3	369.4	18.9
1979	3602081	1N4W27B01S	31st & Mtn. View	San Bernardino, City of	386.8	370.0	16.8
2066	3602422	1S4W02K08S	Antil Well #6	San Bernardino, City of	260.5		
2062	3602400	1N4W32N01S	Baseline Well	San Bernardino, City of	352.3	393.1	-40.8
1510	3600710	2N5W19K02S	Cajon Canyon Well	San Bernardino, City of	13.5	30.1	-16.6
1910	3601844	1N5W03H02S	Cajon Well #2	San Bernardino, City of			
2115	3602821	1N5W03A02S	Cajon Well #3	San Bernardino, City of	119.1	128.9	-9.8
2008	3602206	1N4W06H02S	Devil Canyon #3	San Bernardino, City of	22.3	23.0	-0.7
2007	3602205	1N4W06H01S	Devil Canyon #4	San Bernardino, City of	34.0	34.7	-0.7
3139	G363790	1N04W32PS	EPA Extract Well 112	San Bernardino, City of		580.0	
1537	3600737	1S4W10N06S	Mill & D	San Bernardino, City of	238.8	243.2	-4.4
1514	3600714	1N4W16E01S	Newmark #1	San Bernardino, City of	219.5	184.6	34.9
1516	3600716	1N4W16E03S	Newmark #3	San Bernardino, City of	223.8	192.5	31.3
1647	3601115	1N4W26P03S	Perris Hill #5	San Bernardino, City of			
2448	9900045	1S4W23H	Brier/Gould/Tippecanoe	San Bernardino, City of / shallow wells			
		1S04W22C	Wastewater N MW #1	San Bernardino, City of / shallow wells			
1936	3601944	1N5W23Q01S	2/Lower 7	West Valley Water District	210.0	141.0	69.0
1419	3603769	1N5W25E01S	5A/Lower 5	West Valley Water District	211.0		
1612	3600997	1N5W36H04S	7/Lord 7	West Valley Water District	484		

# Annual Change in Storage for Bunker Hill Basin

Fall 2023 to Fall 2024

Sub-area	[1] Annual Change in Water Level 2024 [ft]	[2] Area [acres]	[3] Storativity (S)	[4] Annual Change in Storage** [acre-ft]
Bunker Hill I - Northeast of 215 Freeway	-3.6	7,795	0.11	-3,069
Bunker Hill I - Southwest of 215 Freeway	14.3	11,714	0.09	15,085
Bunker Hill II - West of Mentone Fault	20.7	35,206	0.06	43,634
Bunker Hill II - East of Mentone Fault, North	-10.6	8,584	0.13	-11,801
Bunker Hill II - East of Mentone Fault, South	1.0	2,507	0.13	326
Lytle Basin - Northwest of Barrier J	-8.0	1,924	0.13	-2,001
Lytle Basin - Southeast of Barrier J	45.3	5,237	0.07	16,606
Pressure Zone - North of Santa Ana Wash	10.5	11,920	0.02	2,507
Pressure Zone - Santa Ana Wash	5.0	6,686	0.02	669

<b>Total =</b>	<b>61,958</b>
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[1] Based on average changes in water level within each Sub-area

[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.

# Accumulated Change in Storage for Bunker Hill Basin

1989 to 2024 (Based on "Zero Year" of 1993)

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	-397,600
2010	-340,623
2011	-224,603
2012	-314,377
2013	-444,322
2014	-535,877
2015	-583,447
2016	-566,555
2017	-522,930
2018	-570,718
2019	-418,310
2020	-486,185
2021	-580,031
2022	-651,262
2023	-424,456
2024	-362,498

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

# Production for Sub-basins of Bunker Hill Basin

Preceding Water Year (July 2023 to June 2024)

Sub-area	Production July 2023 to June 2024 [acre-ft] <sup>2</sup>
Bunker Hill I - Northeast of Interstate 215	4,755
Bunker Hill I - Southwest of Interstate 215	7,609
Bunker Hill II - West of Mentone Fault	22,920
Bunker Hill II - East of Mentone Fault, North	3,841
Bunker Hill II - East of Mentone Fault, South	575
Lytle Basin - Northwest of Barrier J	1,688
Lytle Basin - Southeast of Barrier J	13,640
Pressure Zone - North of Santa Ana Wash	43,717
Pressure Zone - Santa Ana Wash	27,384
<b>Total</b>	<b>126,128</b>

Notes: 182 Wells Used in these Calculations

1 - Refer to Appendix C for Well Values Compiled for Estimate.

2 - Estimated for Water Year July 2023-June 2024 production.

*Data Sources: 15 Primary Water Purveyors,*

*as well as San Bernardino Watermaster, and SBVMWD.*

# Estimates of Percentage of Normal Precipitation for Previous Water Year

July 2023 to June 2024

	[0]		[1]	[2]	[3]	[4]	[5]	[6]	[7]
	July to June		Season - July to December			Season - January to June			Jul. 2023- Jun. 2024
Station	Historic Average Annual	2023-2024	Historic Average	Sum Jul 2023 to Dec 2024	% of Normal	Historic Average	Sum Jan 2023 to Jun 2024	% of Normal	Water Year % of Normal
	[inches]	[inches]	[inches]	[inches]	[%]	[inches]	[inches]	[%]	[%]
Big Bear Dam	31.94	48.19	10.80	11.25	104%	21.14	36.94	175%	151%
Devore CDF	26.45	18.01	8.61	10.13	118%	17.84	7.88	44%	68%
Camp Angelus	23.78	-	7.81	-	-	15.97	-	-	-
Lake Arrowhead	37.57	63.26	12.25	18.16	148%	25.32	45.10	178%	168%
Mentone CDF	12.17	9.70	3.82	2.93	77%	8.35	6.77	81%	80%
Redlands Country Club	12.48	19.76	4.02	4.70	117%	8.46	15.06	178%	158%
San Bernardino County Hospital	15.54	23.05	4.95	4.71	95%	10.59	18.34	173%	148%
Santa Ana Pumphouse #3	16.05	12.78	5.33	4.66	87%	10.72	8.12	76%	80%
Yucaipa CDF	15.37	24.27	5.00	5.81	116%	10.37	18.46	178%	158%

<b>Avg (in) =</b>	<b>21.26</b>	<b>27.38</b>
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<b>Average =</b>	<b>107.8%</b>
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<b>Average =</b>	<b>135.4%</b>
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<b>2023-24 Average =</b>	<b>126.4%</b>
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[1], [4]: Based on data provided by San Bernardino County Department of Transportation/Flood Control

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

[5] = [0] - [2]

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

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

# Average Annual Change in Storage for Bunker Hill Basin

Fall 2014 to Fall 2024

(The Immediate Past 10 Water Years)

Sub-area	[1] Average Change in 10 Years in Water Level* [ft]	[2]  Area  [acres]	[3]  Storativity (S)	[4]  Average Annual Change in Storage** [acre-ft]
Bunker Hill I - Southwest of 215 Freeway	-2.86	11,714	0.09	-2,947
Bunker Hill I - Northeast of 215 Freeway	1.52	7,795	0.11	1,300
Bunker Hill II - West of Mentone Fault	2.92	35,206	0.06	6,059
Bunker Hill II - East of Mentone Fault	5.15	11,091	0.13	7,420
Lytle Basin - Southeast of Barrier J	7.98	5,237	0.07	2,926
Lytle Basin - Northwest of Barrier J	1.64	1,924	0.13	410
Pressure Zone - North of Santa Ana Wash	1.82	11,920	0.02	434
Pressure Zone - Santa Ana Wash	-3.21	6,686	0.02	-429

<b>Total = 15,173</b>
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[1] Based on average annual changes in water level within each Sub-area over last 10 years.

[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 is an increase in water level and a negative sign is a decline in water level.

## Summary of Surface Distribution Water for Bunker Hill Basin

1995 to 2024

Streamflow Diversions	1996 [acre-ft]	1997 [acre-ft]	1998 [acre-ft]	1999 [acre-ft]	2000 [acre-ft]	2001 [acre-ft]	2002 [acre-ft]	2003 [acre-ft]	2004 [acre-ft]	2005 [acre-ft]	2006 [acre-ft]	2007 [acre-ft]	2008 [acre-ft]	2009 [acre-ft]	2010 [acre-ft]
<b>Lytile Creek</b>															
Fontana Union WC	10,730	7,266	8,626	9,695	4,131	5,829	2,906	3,029	3,774	4,439	12,203	6,516	6,727	5,776	10,052
Mount Vernon WC	0	0	0	312	786	778	975	1,442	754	70	250	437	927	1,132	167
Rialto, City of	1,070	393	896	1,461	NA	1,305	1,143	726	1,707	1,209	1,448	1,160	1,165	1,135	1,000
San Bernardino, City of	2,400	0	0	0	0	0	0	0	580	5	254	483	498	450	450
West Valley Water District	3,686	4,079	3,696	3,408	3,047	3,175	2,573	2,380	4,710	2,079	3,081	NA	3,369	2,435	3,322
<b>Subtotal</b>	<b>17,886</b>	<b>11,738</b>	<b>13,218</b>	<b>14,876</b>	<b>7,964</b>	<b>11,087</b>	<b>7,597</b>	<b>7,577</b>	<b>11,525</b>	<b>7,802</b>	<b>17,236</b>	<b>8,596</b>	<b>12,686</b>	<b>10,928</b>	<b>14,991</b>
<b>Mill Creek</b>															
Redlands, City of	12,250	10,250	11,224	11,951	8,852	9,496	5,867	12,541	10,168	12,574	15,409	9,607	12,332	7,785	10,076
SBVWCD Mill Creek Spreading	3,791	5,576	17,227	2,025	3,868	3,337	352	4,489	3,089	29,138	9,510	1,531	3,810	4,450	8,891
<b>Subtotal</b>	<b>16,041</b>	<b>15,826</b>	<b>28,451</b>	<b>13,976</b>	<b>12,720</b>	<b>12,833</b>	<b>6,219</b>	<b>17,030</b>	<b>13,257</b>	<b>41,712</b>	<b>24,919</b>	<b>11,138</b>	<b>16,142</b>	<b>12,235</b>	<b>18,967</b>
<b>Bunker Hill Creeks</b>															
Arrowhead Water & Power West Twin Crk									50	50	50	50	40	40	40
Arrowhead Water & Power East Twin Crk	3,273	4,451	9,734	2,276	1,420	1,339	616		2,500	1,750	1,700	1,725	3	0	0
Devore Water Company Kimbark Lower Cajon									29	97	80	62	68	51	56
<b>Subtotal</b>	<b>3,273</b>	<b>4,451</b>	<b>9,734</b>	<b>2,276</b>	<b>1,420</b>	<b>1,339</b>	<b>616</b>	<b>0</b>	<b>2,579</b>	<b>1,897</b>	<b>1,830</b>	<b>1,837</b>	<b>111</b>	<b>91</b>	<b>96</b>
<b>Santa Ana River</b>															
Bear Valley Mutual WC	38,252	31,479	36,632	30,245	29,498	26,301	23,458	12,633	11,227	12,516	17,689	11,560	13,519	7,303	7,000
Redlands Water Co		760							588	981	1,044	884	625	654	629
SBVWCD SAR Spreading	13,331	10,361	40,346	6,167	5,085	3,315	1,371	12,330	5,669	27,841	14,476	4,002	17,550	8,456	21,662
<b>Subtotal</b>	<b>51,583</b>	<b>42,600</b>	<b>76,978</b>	<b>36,412</b>	<b>34,583</b>	<b>29,616</b>	<b>24,829</b>	<b>24,963</b>	<b>17,484</b>	<b>41,338</b>	<b>33,209</b>	<b>16,446</b>	<b>31,694</b>	<b>16,413</b>	<b>29,291</b>
<b>Imported Water Spreading</b>															
Sweetwater basin	96	0	4	0	4,194	1,725	6,559	4,654	2,684	2,420	2,414	5,205	4,994	3,002	3,983
Badger Basin	0	0	0	0	4	0	0	0	4	0	0	0	0	0	
Waterman Basin	0	0	0	0	0	0	3,528	250	0	0	0	39	9,216	9,368	12,499
SBVWCD Santa Ana Basins	0	0	0	0	99	7,153	6,853	2,229	924	2,117	3,782	1,994	56	1,689	14
SBVWCD Mill Creek Basins						1,462	1,696					0		1,022	665
<b>Subtotal</b>	<b>96</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>4,297</b>	<b>10,340</b>	<b>18,636</b>	<b>7,133</b>	<b>3,612</b>	<b>4,537</b>	<b>6,196</b>	<b>7,238</b>	<b>14,266</b>	<b>15,081</b>	<b>17,161</b>

Streamflow Diversions	2011 [acre-ft]	2012 [acre-ft]	2013 [acre-ft]	2014 [acre-ft]	2015 [acre-ft]	2016 [acre-ft]	2017 [acre-ft]	2018 [acre-ft]	2019 [acre-ft]	2020 [acre-ft]	2021 [acre-ft]	2022 [acre-ft]	2023 [acre-ft]	2024 [acre-ft]	Avg. [acre-ft]
<b>Lytile Creek</b>															
Fontana Union WC	18,037	7,656	3,775	3,586	3,407	3,236	3,075	2,921	3,087	5,479	3,813	1,967	6,057	15,135	<b>6,308</b>
Mount Vernon WC	685	578	520	468	421	379	341	307	276	276	276	276	276	276	<b>462</b>
Rialto, City of	1,148	1,319	996	1,020	871	1,041	1,206	1,133	950	1,509	1,230	1,529	904	1,059	<b>1,133</b>
San Bernardino, City of	0	0	0	0	0	0	0	0	0	1,853	0	0	910	1,871	<b>336</b>
West Valley Water District	3,382	2,954	2,369	3,810	3,389	1,737	2,516	2,291	5,717	3,851	2,807	3,372	3,773	4,250	<b>3,259</b>
<b>Subtotal</b>	<b>23,252</b>	<b>12,507</b>	<b>7,660</b>	<b>8,884</b>	<b>8,088</b>	<b>6,393</b>	<b>7,138</b>	<b>6,652</b>	<b>10,030</b>	<b>12,968</b>	<b>8,126</b>	<b>7,144</b>	<b>11,921</b>	<b>22,591</b>	<b>11,498</b>
<b>Mill Creek</b>															
Redlands, City of	13,492	6,085	7,041	4,657	3,912	4,400	6,121	5,818	5,650	6,045	5,459	5,285	12,079	6,475	<b>8,721</b>
SBVWCD MC	16,185	4,666	1,734	888	1,080	1,057	5,395	1,998	9,324	5,373	2,027	1,910	16,631	12,272	<b>6,263</b>
<b>Subtotal</b>	<b>29,677</b>	<b>10,751</b>	<b>8,775</b>	<b>5,545</b>	<b>4,992</b>	<b>5,457</b>	<b>11,515</b>	<b>7,816</b>	<b>14,974</b>	<b>11,418</b>	<b>7,486</b>	<b>7,195</b>	<b>28,710</b>	<b>18,747</b>	<b>14,984</b>
<b>Bunker Hill Creeks</b>															
Arrowhead Water & Power West Twin Crk	46	46	41	46	46	46	47	47	47	47	47	47	47	47	<b>46</b>
Arrowhead Water & Power East Twin Crk	1,097	1,097	987	889	800	720	648	583	525	472	425	383	383	383	<b>1,435</b>
Devore Water Company Kimbark	78	37	33	63	63	63	63	63	63	63	63	63	63	59	<b>61</b>
<b>Subtotal</b>	<b>1,221</b>	<b>1,180</b>	<b>1,062</b>	<b>997</b>	<b>908</b>	<b>828</b>	<b>757</b>	<b>693</b>	<b>634</b>	<b>582</b>	<b>535</b>	<b>492</b>	<b>493</b>	<b>489</b>	<b>1,542</b>
<b>Santa Ana River</b>															
Bear Valley Mutual WC	14,673	12,583	8,440	5,011	3,900	3,590	6,823	6,189	7,387	11,225	8,277	2,399	4,894	8,901	<b>14,262</b>
Redlands Water Co	739	4,917	2,036	5,201	5,629	6,957	6,059	5,845	5,032	5,796	3,610	2,807	3,249	3,853	<b>3,086</b>
SBVWCD SAR Spreading	36,801	9,073	5,519	1,537	2,982	2,766	20,924	2,618	35,688	18,377	5,194	8,245	48,894	32,387	<b>14,585</b>
<b>Subtotal</b>	<b>52,213</b>	<b>26,573</b>	<b>15,995</b>	<b>11,749</b>	<b>12,511</b>	<b>13,312</b>	<b>33,806</b>	<b>14,651</b>	<b>48,108</b>	<b>35,398</b>	<b>17,081</b>	<b>13,451</b>	<b>57,037</b>	<b>45,141</b>	<b>31,933</b>
<b>Imported Water Spreading</b>															
Sweetwater basin	4,457	6,413	4,514	1,672	4,933	6,286	6,083	1,683	2,819	1,446	0	2	3,529	2,358	<b>3,039</b>
Badger Basin	1,649	2,875	404	0	0	3,429	3,322	466	0	0	0	0	442	9	<b>450</b>
Waterman Basin	10,667	14,089	7,533	0	4,543	12,799	19,108	9,902	22,480	5,316	0	0	11,516	8,195	<b>5,553</b>
SBVWCD Santa Ana Basins	1,515	603	2	19	61	5,399	22,087	3,608	19,327	0	0	0	7,768	18,520	<b>3,649</b>
SBVWCD Mill Creek Basins	711	510	0	0	0	500	3,916	468	10,643	171	0	0	7,986	8,201	<b>1,997</b>
<b>Subtotal</b>	<b>18,999</b>	<b>24,490</b>	<b>12,453</b>	<b>1,691</b>	<b>9,537</b>	<b>28,413</b>	<b>54,516</b>	<b>16,127</b>	<b>55,269</b>	<b>6,933</b>	<b>0</b>	<b>2</b>	<b>31,241</b>	<b>37,284</b>	<b>14,689</b>

Assumed as average and are provisional data.

**Total = 74,646**

'24 Total = 124,251

**Surface Diversions, comments:**

The amount of water for surface distribution for the ensuing water year (October 1, 2024 to September 30, 2025) was estimated based on the average surface for the Santa Ana River, Bunker Hill Creeks, Mill Creek, and Lytle Creek for the period of 1990 to 2025. As shown in Table 8 above, the average surface diversion for the Santa Ana River, Bunker Hill Creek, Mill Creek, and Lytle Creek, including Department of Water Resources purchased water, between 1995 to 2025 was 31,933; 1,542; 14,984; 11,498 acre-feet respectively.