

Engineering Investigation of the Bunker Hill Basin 2022-2023

Figures



**San Bernardino Valley
Water Conservation District**

Helping Nature Store Our Water

Figure 1: Project Area Engineering Investigation Report 2024

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
February 8, 2024



**San Bernardino Valley
Water Conservation District**
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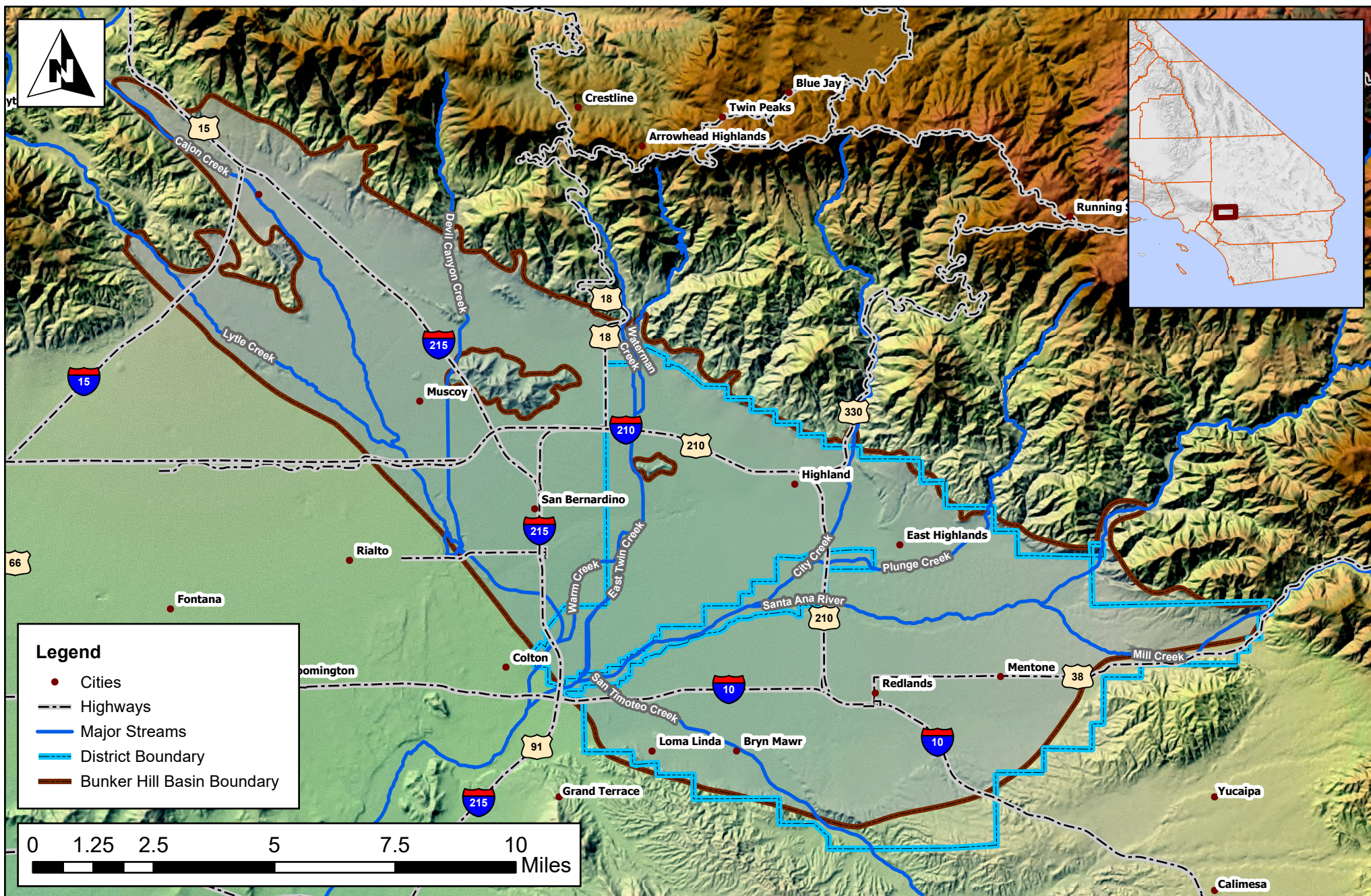


Figure 2: District and Water Agency Boundaries Engineering Investigation Report 2024

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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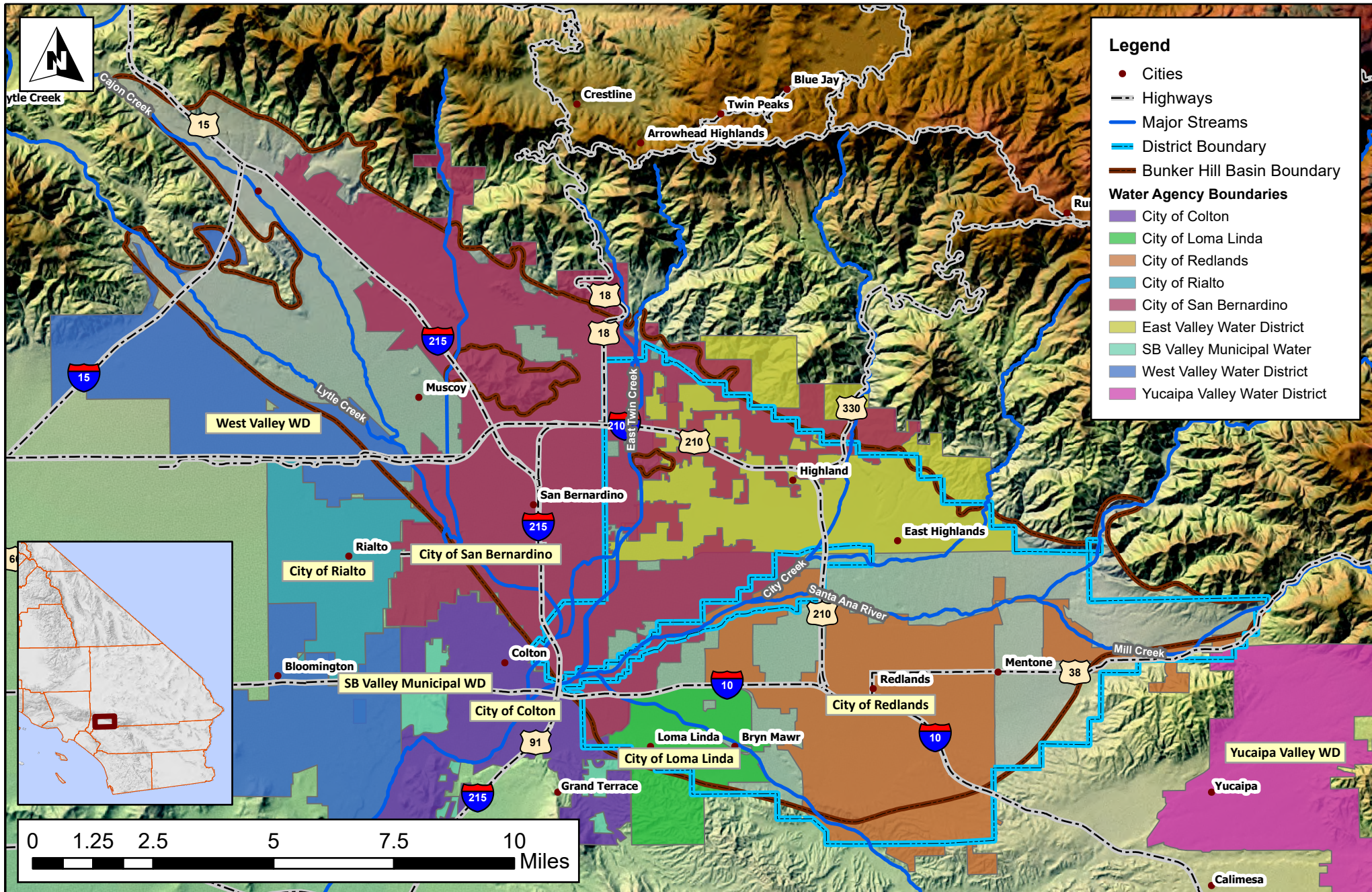


Figure 3: Bunker Hill Sub Basins Engineering Investigation Report 2024

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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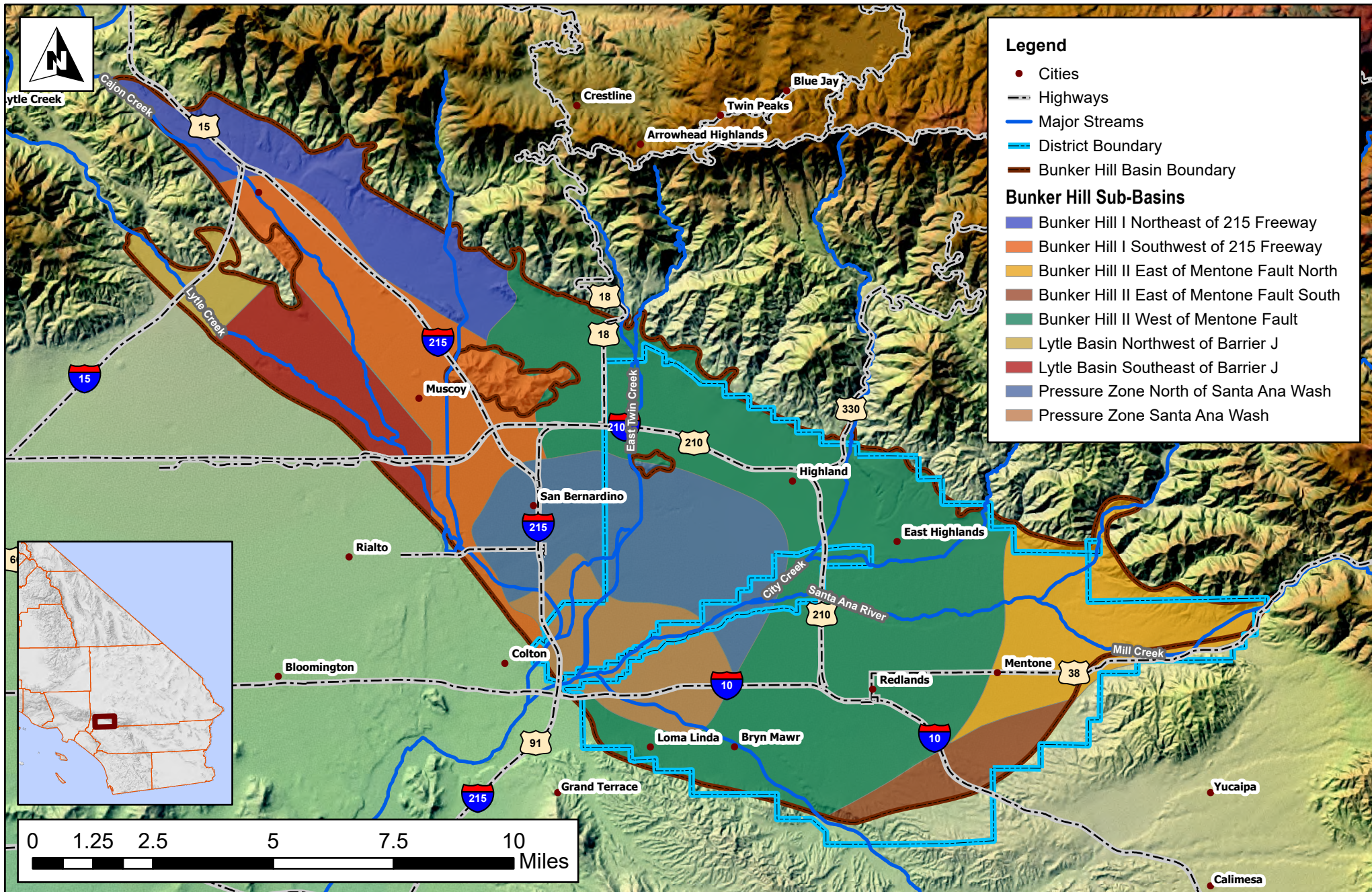


Figure 4: Precipitation Trends and Station Locations October 2022 - September 2023 Engineering Investigation Report 2024

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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February 8, 2024



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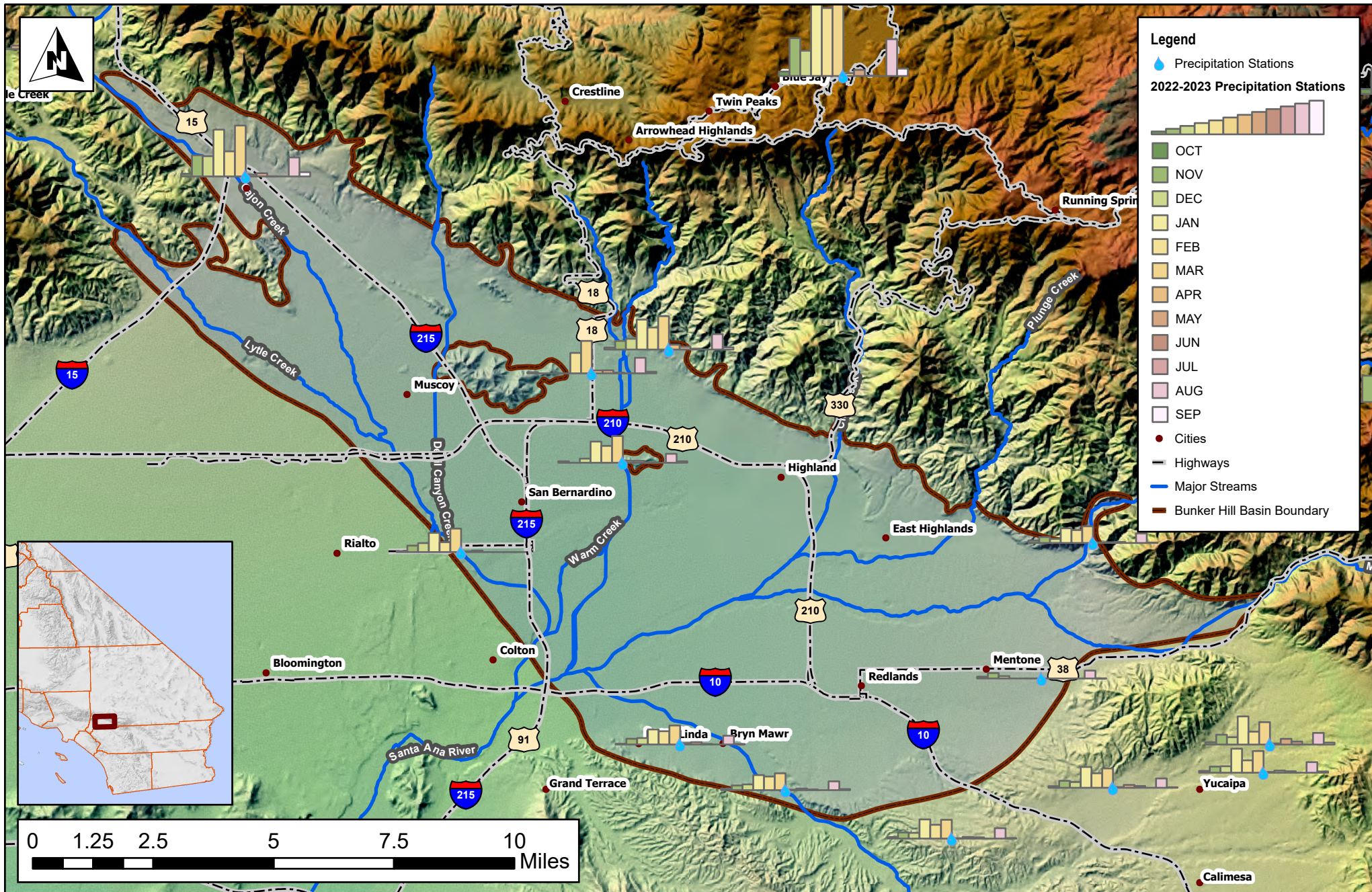


Figure 5: Water Elevation Contour Surface Fall 2022 Engineering Investigation Report 2024

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
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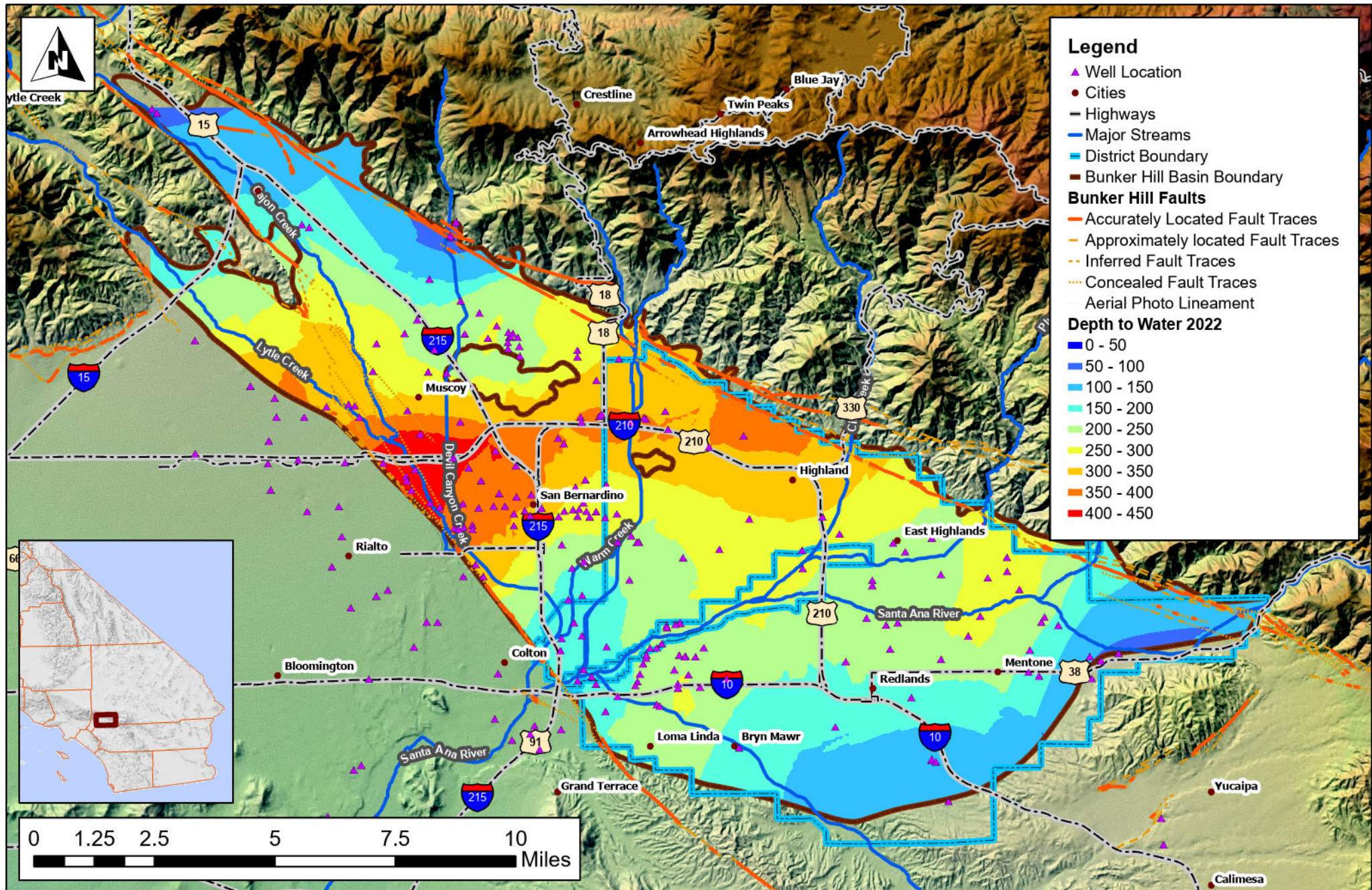


Figure 6: Water Elevation Contour Surface Fall 2023 Engineering Investigation Report 2024

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
February 8, 2024

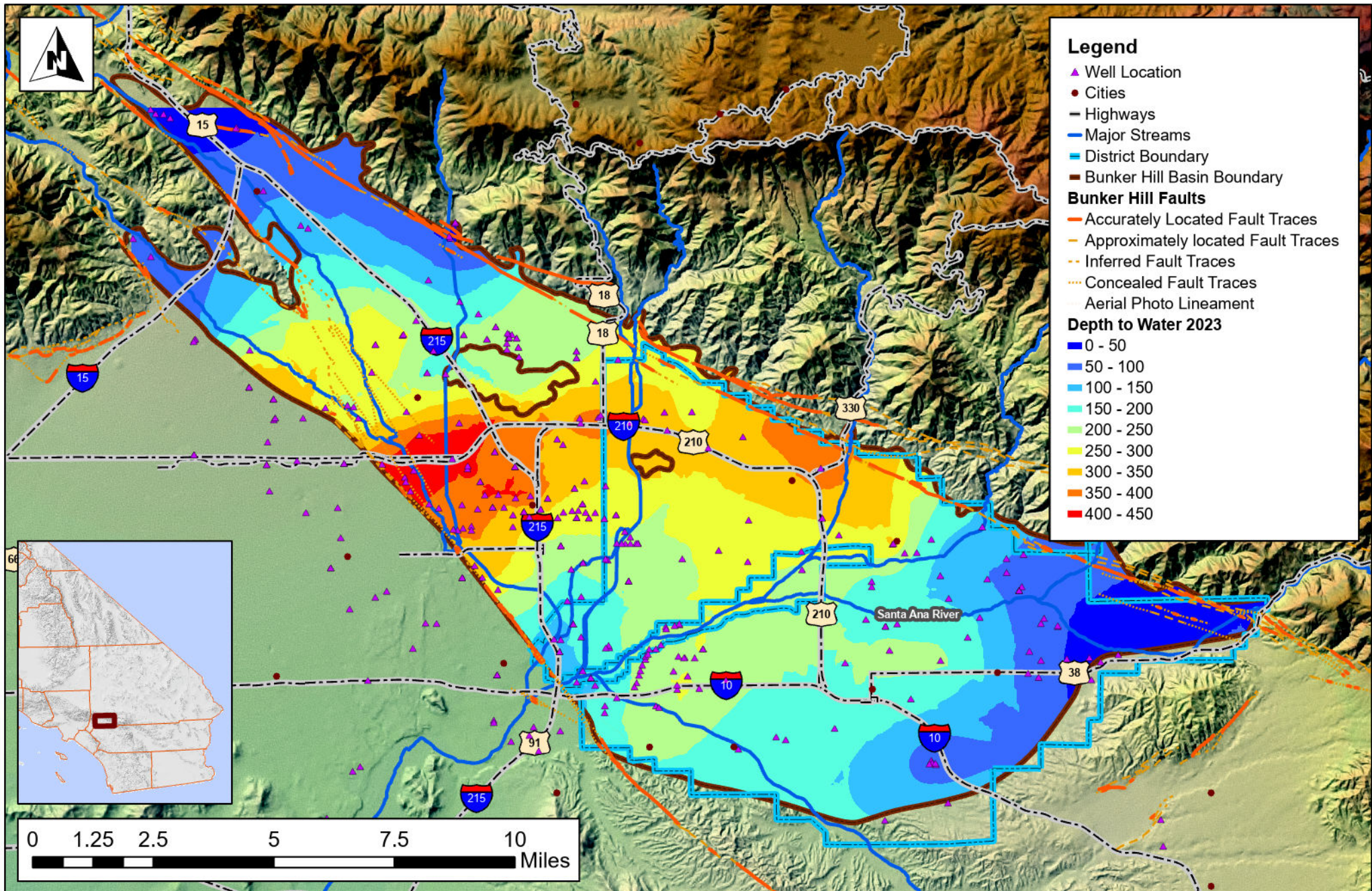


Figure 7: Key Wells (Appendix B Hydrographs) 2022-2023 Engineering Investigation Report 2024

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: L. Torres
February 8, 2024

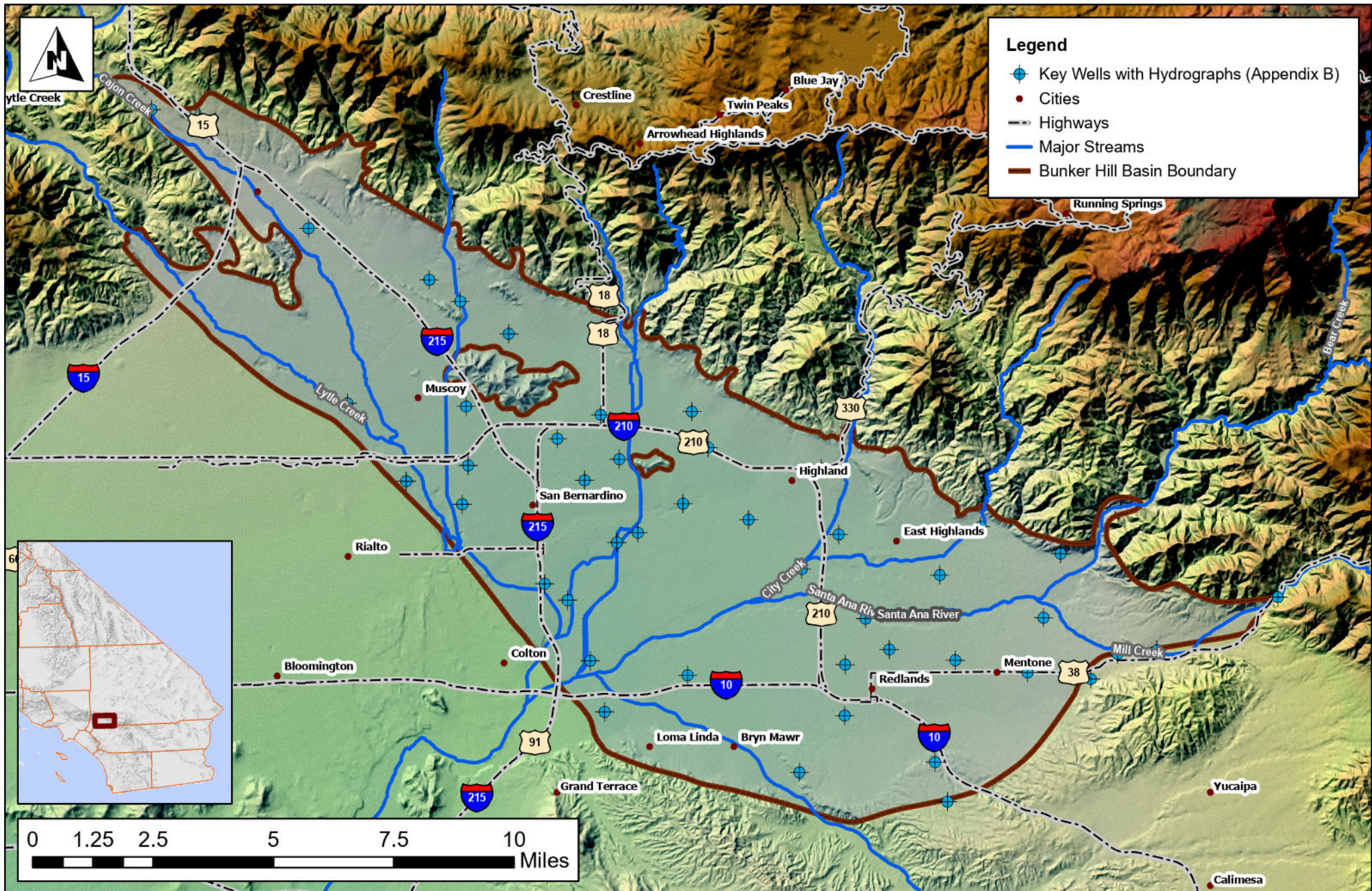
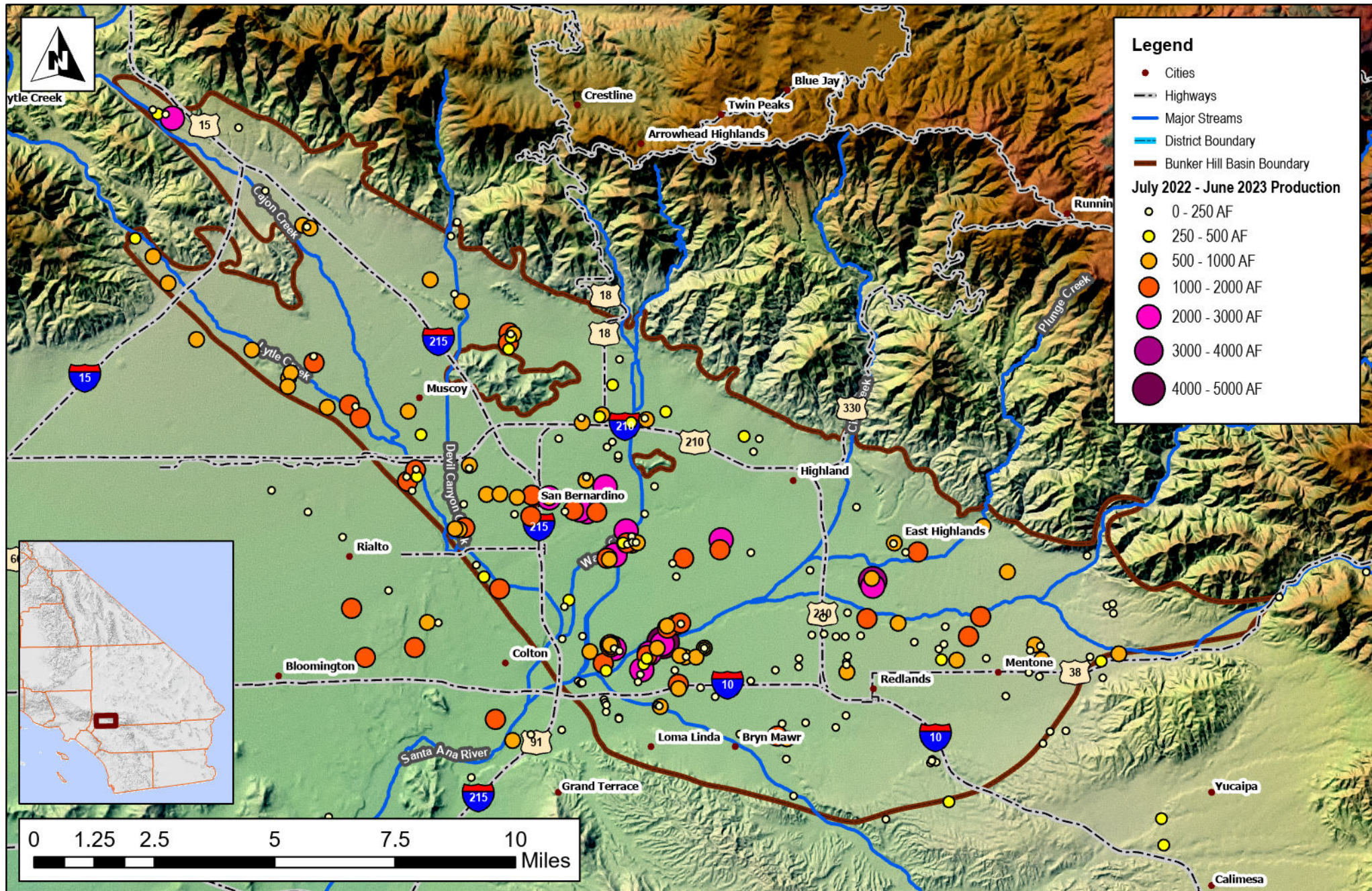


Figure 8: Groundwater Production Bunker Hill Basin Total Well Production for July 2022 - June 2023 Engineering Investigation Report 2024

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
February 8, 2024

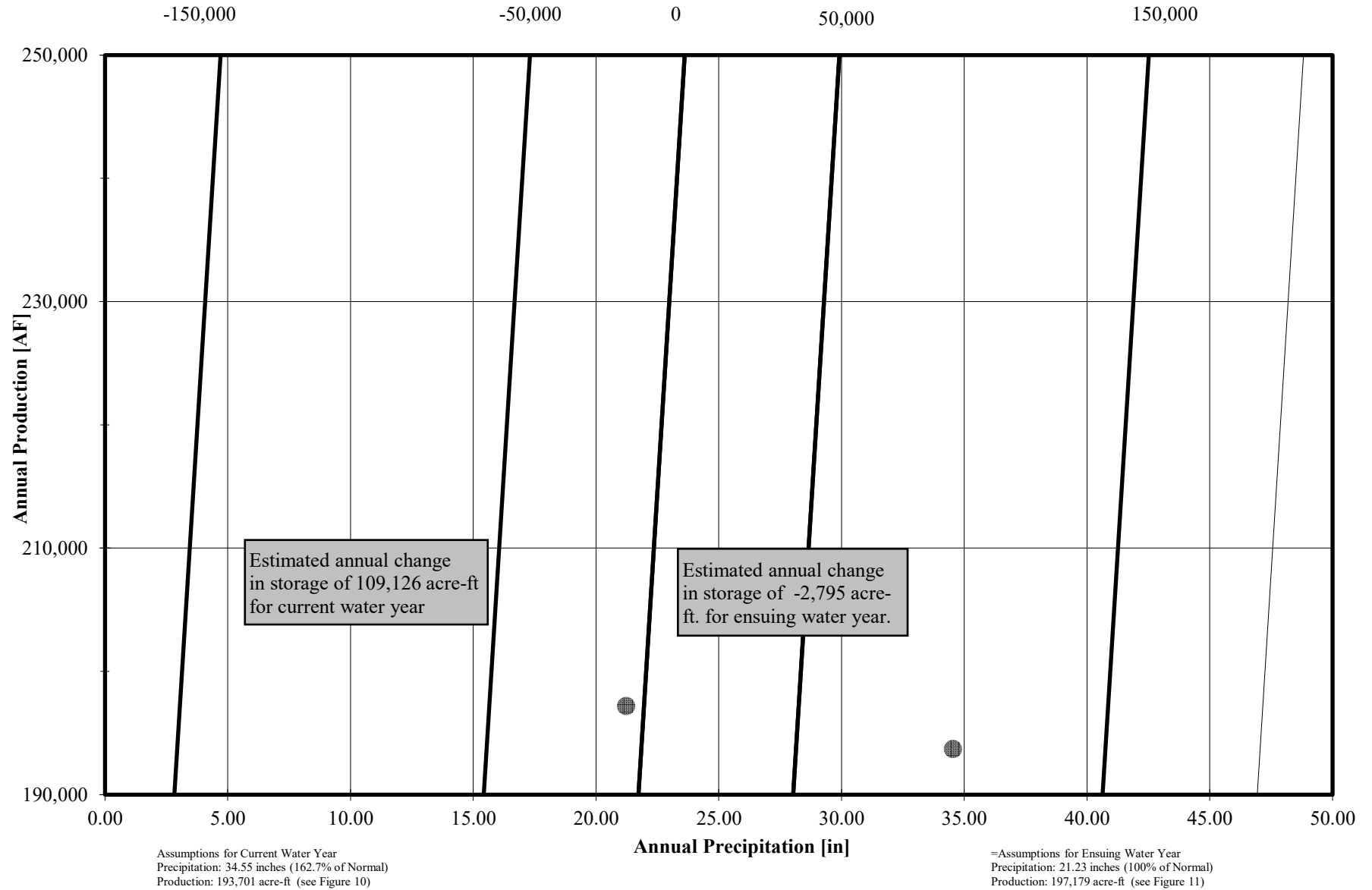


**San Bernardino Valley
Water Conservation District**
Helping Nature Store Our Water



Prediction Chart for Annual Change in Storage

Current and Ensuing Water Years

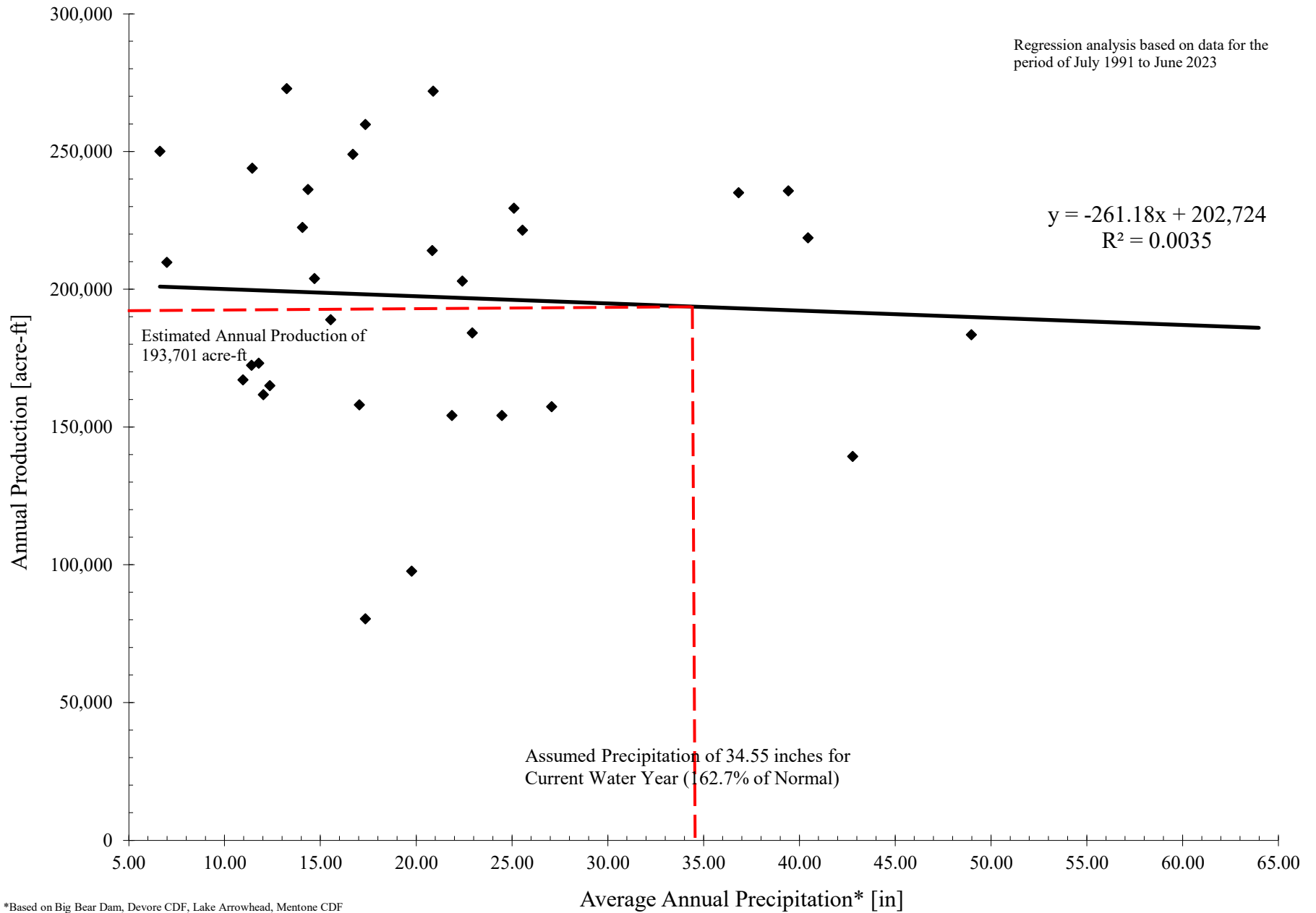


* Based on Big Bear Dam, Devore CDF, Lake Arrowhead, Mentone CDF
 Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

Estimate of Production for Current Water Year

(July 2022 to June 2023)

Regression analysis based on data for the period of July 1991 to June 2023

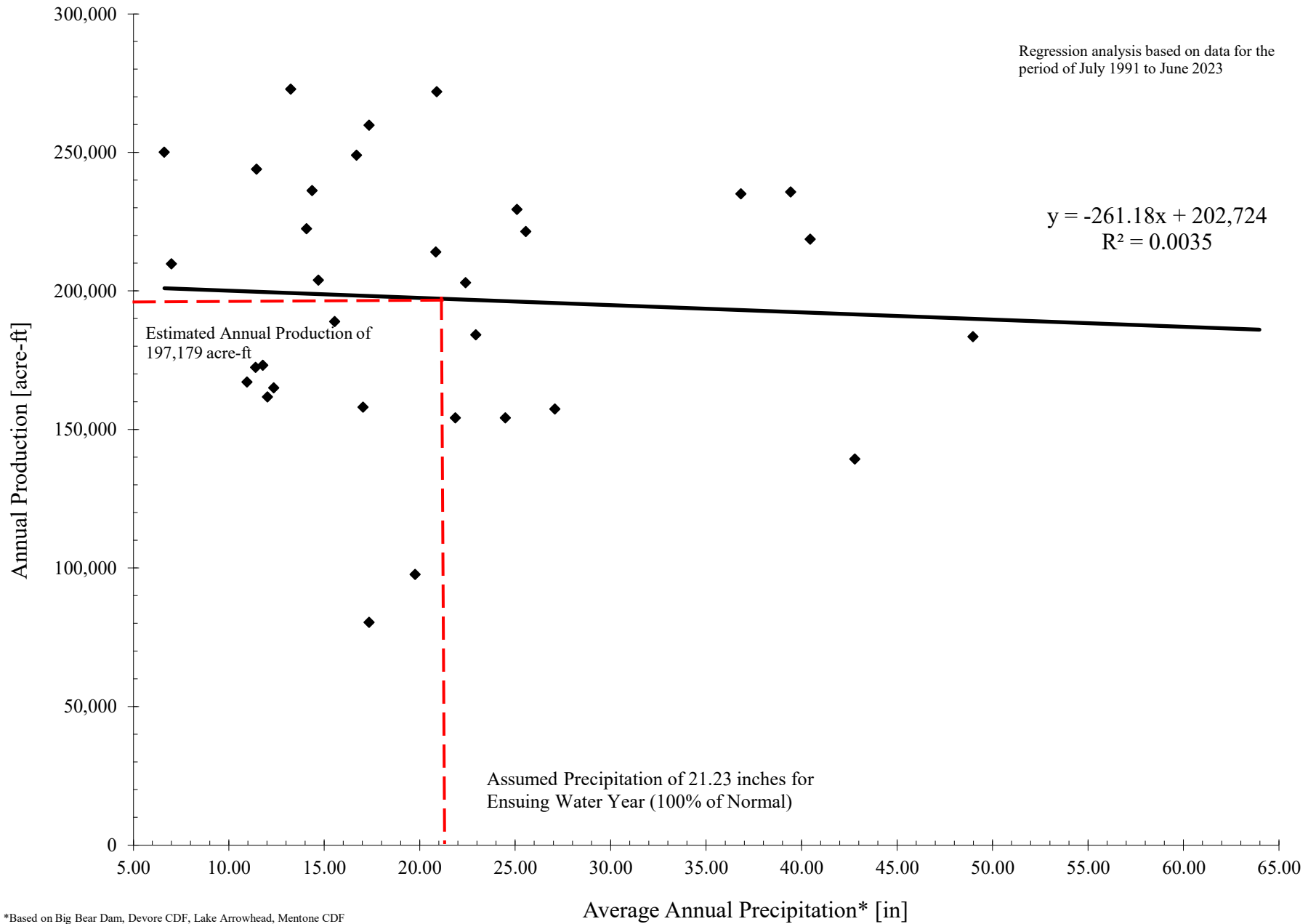


*Based on Big Bear Dam, Devore CDF, Lake Arrowhead, Mentone CDF, Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

Estimate of Production for Ensuing Water Year

(July 2023 to June 2024)

Regression analysis based on data for the period of July 1991 to June 2023



*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 2022-2023

Tables



**San Bernardino Valley
Water Conservation District**

Helping Nature Store Our Water

Summary of Percentage of Normal Precipitation

1992
to 2023
(Water Year - Oct. to Sept.)

Station	Historic Annual Avg. [in]	1992 -1993 [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]	Each Station 30 Yr. Avg. [in.]
Big Bear City	48.39	26.01	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	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	11.30
Big Bear Dam	32.71	69.70	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	29.58
Camp Angelus	24.90	0.00	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	26.11
Crafton Hills	13.71	28.18	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	14.04
Del Rosa Ranger Station	17.91	41.39	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	17.66
Devore CDF	26.49	65.45	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	26.41
Fallsvale	29.56	71.90	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	31.14
Lake Arrowhead	37.34	19.27	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	14.733	24.3	48.81	17.27	50.816	40.3	29.07	46.64	102.73	35.10
Loma Linda FD	10.97	24.27	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	9.5	7.86	16.13	5.91	17.36	15.17	7.16	8	20.48	11.57
Lytle Creek at Foothill	12.99	31.59	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	12.61
Lytle Creek Fire Station	23.27	87.71	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	21.94
Mentone CDF	12.29	27.40	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	11.58
Oak Glen	24.01	57.96	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	23.11
Redlands - Roth	11.35	25.57	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	10.56
Redlands Country Club	12.21	26.96	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	11.85
San Bernardino CDF	16.65	37.35	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	15.84
San Bernardino Co. Hospital	15.93	34.44	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	14.18
Santa Ana Pumphouse #3	15.95	36.68	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	13.59
Yucaipa CDF	14.83	34.60	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	14.49
Yucaipa Valley Water District	15.24	32.37	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	14.86

Percent of Normal	100%	187%	73%	158%	74%	95%	177%	47%	60%	61%	25%	99%	59%	172%	82%	29%	81%	65%	91%	118%	58%	43%	49%	65%	56%	114%	48%	130%	95%	49%	79%	197%	88%
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Total Station Average	20.83
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Source: San Bernardino County Department of Transportation/Flood Control

Change in Groundwater Levels in Key Wells

Fall 2021 to Fall 2022

WCD Code	Recordation Number	State Well Number	Well Name	Owner Or Measuring Agency	2022 Depth To Water (ft)	2023 Depth To Water (ft)	Difference Fall 2022 to Fall 2023
1865	3601675	1N4W25A01S	27	East Valley Water District		189.0	
1984	3602113	1N3W30N01S	41	East Valley Water District	355.0	308.0	47.0
1364	3600026	1S3W04J01S	102	East Valley Water District	271.0	260.0	11.0
1401	3600220	1S3W01H01S	142 Mt. Harrison	East Valley Water District	280.0	150.0	130.0
1660	3601184	1N3W33F01S	94 Corwin	East Valley Water District	423	418	5.0
1851	3601660	1S3W06H04S	9A	East Valley Water District	269.0	262.0	7.0
1010	9900021	1S3W09E02S	Tri-City Concrete	East Valley Water District	275.0	254.0	21.0
2271	3602855	1S4W25D07S	Anderson III	Loma Linda University	265.5	237	28.5
1727	3601308	1S2W19K01S	Agate #1	Redlands, City of	160.0	71.0	89.0
1708	3601283	1S2W22C02S	E. Lugonia #2	Redlands, City of			
1712	3601287	1S2W21B02S	E. Lugonia #3	Redlands, City of	42.0	23.0	19.0
1714	3601290	1S2W21D01S	E. Lugonia #6	Redlands, City of	54.0	23.0	31.0
1970	3602065	1S3W32J02S	Lee Well	Redlands, City of			
1706	3601281	1S2W36F01S	Maguet #1	Redlands, City of	27.0	15.0	12.0
1709	3601284	1S2W21E01S	Maguet #2	Redlands, City of	62.0	36.0	26.0
1707	3601282	1S1W08H01S	Mill Creek #1	Redlands, City of			
1819	3601586	1S3W15F01S	Orange Street	Redlands, City of	190.0	164.0	26.0
1591	3600918	2S3W01E01S	Redlands Heights	Redlands, City of	183.0	184.0	-1.0
1718	3601294	1S3W35G09S	Well #13	Redlands, City of	63.0	61.0	2.0
1720	3601296	1S3W35H03S	Well #16	Redlands, City of	44.0	43.0	1.0
1722	3601298	1S3W21H01S	Well #32	Redlands, City of			
1723	3601299	1S4W24K01S	Well #34	Redlands, City of	256.0	256.0	0.0
1964	3602032	1S3W22A02S	Well #35	Redlands, City of	255.0	234.0	21.0
1725	3601301	1S3W28H01S	Well #41	Redlands, City of			
1702	3601263	1N5W23Q01S	City 1	Rialto, City of	257.0	247.0	10.0
1668	3601225	1S4W02P02S	Cooley D	Riverside, City of	240.4	235.1	5.3
1662	3601218	1S4W14P02S	Raub 1	Riverside, City of			
1677	3601234	1S4W27A19S	Stewart 19	Riverside, City of			
1744	3601431	1S4W27H01S	Stewart 20	Riverside, City of	205.3	190.5	14.8
1767	3601478	1S4W22B03S	Thorn 10	Riverside, City of			
1683	3601240	1S4W22H04S	Warren 1	Riverside, City of			
1554	3600787	1S4W23A02S	26-1	Riverside, City Of-Gage Canal	201.0	198.0	3.0
2291	229101	1S2W07B01S	SBVWCD #1	San Bernardino Valley Water Cons. Dist.		96.5	
2290	229001	1S2W07K01S	SBVWCD #2	San Bernardino Valley Water Cons. Dis	215.1	29.8	185.3
2286	228601	1S3W12J01S	SBVWCD #3	San Bernardino Valley Water Cons. Dis	255.6	68.3	187.3
2288	228801	1S3W11H01S	SBVWCD #4	San Bernardino Valley Water Cons. Dis	208.0	109.0	99.0
1525	3600725	1N4W34G01S	17th & Sierra Way #2	San Bernardino, City of			
1517		1N4W32D03S	19th Street No. 1	San Bernardino, City of	391.3	392.0	-0.7
1520	3600720	1N4W27M02S	27th Street Well	San Bernardino, City of	320.9	323.8	-2.9
1519	3600719	1N4W27G01S	30th & Mtn. View	San Bernardino, City of	391.1	388.3	2.8
1979	3602081	1N4W27B01S	31st & Mtn. View	San Bernardino, City of	389.7	386.8	2.9
2066	3602422	1S4W02K08S	Antil Well #6	San Bernardino, City of	241.8	260.5	-18.7
2062	3602400	1N4W32N01S	Baseline Well	San Bernardino, City of	404.5	352.3	52.2
1510	3600710	2N5W19K02S	Cajon Canyon Well	San Bernardino, City of	67.7	13.5	54.2
1910	3601844	1N5W03H02S	Cajon Well #2	San Bernardino, City of			
2115	3602821	1N5W03A02S	Cajon Well #3	San Bernardino, City of	197.4	119.1	78.3
2008	3602206	1N4W06H02S	Devil Canyon #3	San Bernardino, City of	24.5	22.3	2.2
2007	3602205	1N4W06H01S	Devil Canyon #4	San Bernardino, City of	42.7	34.0	8.7
3139	G363790	1N04W32PS	EPA Extract Well 112	San Bernardino, City of			
1537	3600737	1S4W10N06S	Mill & D	San Bernardino, City of	228.0	238.8	-10.8
1514	3600714	1N4W16E01S	Newmark #1	San Bernardino, City of		219.5	
1516	3600716	1N4W16E03S	Newmark #3	San Bernardino, City of	249.4	223.8	25.6
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	291.0	210.0	81.0
1419	3603769	1N5W25E01S	5A/Lower 5	West Valley Water District	283.0	211.0	72.0
1612	3600997	1N5W36H04S	7/Lord 7	West Valley Water District	464	484	-20.0

Annual Change in Storage for Bunker Hill Basin

Fall 2022 to Fall 2023

Sub-area	[1] Annual Change in Water Level 2023 [ft]	[2] Area [acres]	[3] Storativity (S)	[4] Annual Change in Storage** [acre-ft]
Bunker Hill I - Northeast of 215 Freeway	31.2	7,795	0.11	26,773
Bunker Hill I - Southwest of 215 Freeway	13.0	11,714	0.09	13,669
Bunker Hill II - West of Mentone Fault	24.7	35,206	0.06	52,070
Bunker Hill II - East of Mentone Fault, North	102.0	8,584	0.13	113,845
Bunker Hill II - East of Mentone Fault, South	1.9	2,507	0.13	605
Lytle Basin - Northwest of Barrier J	23.0	1,924	0.13	5,753
Lytle Basin - Southeast of Barrier J	37.9	5,237	0.07	13,909
Pressure Zone - North of Santa Ana Wash	-0.1	11,920	0.02	-23
Pressure Zone - Santa Ana Wash	1.5	6,686	0.02	206

Total =	226,806
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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 2022 (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

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 2022 to June 2023)

Sub-area	Production July 2022 to June 2023 [acre-ft] ²
Bunker Hill I - Northeast of Interstate 215	4,530
Bunker Hill I - Southwest of Interstate 215	8,154
Bunker Hill II - West of Mentone Fault	29,214
Bunker Hill II - East of Mentone Fault, North	3,067
Bunker Hill II - East of Mentone Fault, South	859
Lytle Basin - Northwest of Barrier J	1,723
Lytle Basin - Southeast of Barrier J	12,494
Pressure Zone - North of Santa Ana Wash	40,310
Pressure Zone - Santa Ana Wash	38,945
Total	139,296

Notes: 183 Wells Used in these Calculations

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

2 - Estimated for Water Year July 2022-June 2023 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 2022 to June 2023

	[0]		[1]	[2]	[3]	[4]	[5]	[6]	[7]
	July to June		Season - July to December			Season - January to June			Jul. 2022- Jun. 2023
Station	Historic Average Annual	2022-2023	Historic Average	Sum Jul 2022 to Dec 2022	% of Normal	Historic Average	Sum Jan 2023 to Jun 2023	% of Normal	Water Year % of Normal
	[inches]	[inches]	[inches]	[inches]	[%]	[inches]	[inches]	[%]	[%]
Big Bear Dam	31.82	82.22	10.80	14.81	137%	21.02	67.41	321%	258%
Devore CDF	26.56	48.74	8.59	13.06	152%	17.98	35.68	198%	183%
Camp Angelus	24.07	-	7.90	-	-	16.16	-	-	-
Lake Arrowhead	37.30	95.94	12.19	24.23	199%	25.11	71.71	286%	257%
Mentone CDF	12.20	3.10	3.83	3.10	81%	8.37	0.00	0%	25%
Redlands Country Club	12.36	20.61	4.01	5.25	131%	8.35	15.36	184%	167%
San Bernardino County Hospital	15.45	21.14	4.97	1.97	40%	10.48	19.17	183%	137%
Santa Ana Pumphouse #3	16.08	16.65	5.33	3.71	70%	10.75	12.94	120%	104%
Yucaipa CDF	15.24	25.92	4.99	5.50	110%	10.25	20.42	199%	170%

Avg (in) =	21.23	39.29
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Average =	114.9%
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Average =	186.4%
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2022-23 Average =	162.7%
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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 2013 to Fall 2023
(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	-7.91	11,714	0.09	-8,149
Bunker Hill I - Northeast of 215 Freeway	-4.95	7,795	0.11	-4,240
Bunker Hill II - West of Mentone Fault	-5.76	35,206	0.06	-11,963
Bunker Hill II - East of Mentone Fault	-2.35	11,091	0.13	-3,385
Lytle Basin - Southeast of Barrier J	-5.57	5,237	0.07	-2,042
Lytle Basin - Northwest of Barrier J	-1.00	1,924	0.13	-251
Pressure Zone - North of Santa Ana Wash	-5.66	11,920	0.02	-1,349
Pressure Zone - Santa Ana Wash	-5.37	6,686	0.02	-718

Total = -32,099

[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 2023

Streamflow Diversions	1995 [acre-ft]	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]
Lytle Creek															
Fontana Union WC	9,893	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
Mount Vernon WC	0	0	0	0	312	786	778	975	1,442	754	70	250	437	927	1,132
Rialto, City of	44	1,070	393	896	1,461	NA	1,305	1,143	726	1,707	1,209	1,448	1,160	1,165	1,135
San Bernardino, City of	2,400	2,400	0	0	0	0	0	0	0	580	5	254	483	498	450
West Valley Water District	3,696	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
Subtotal	16,033	17,886	11,738	13,218	14,876	7,964	11,087	7,597	7,577	11,525	7,802	17,236	8,596	12,686	10,928
Mill Creek															
Redlands, City of	9,786	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
SBVWCD Mill Creek Spreading	16,347	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
Subtotal	26,133	16,041	15,826	28,451	13,976	12,720	12,833	6,219	17,030	13,257	41,712	24,919	11,138	16,142	12,235
Bunker Hill Creeks															
Arrowhead Water & Power West Twin Crk										50	50	50	50	40	40
Arrowhead Water & Power East Twin Crk	9,277	3,273	4,451	9,734	2,276	1,420	1,339	616		2,500	1,750	1,700	1,725	3	0
Devore Water Company Kimbark Lower Cajon										29	97	80	62	68	51
Subtotal	9,277	3,273	4,451	9,734	2,276	1,420	1,339	616	0	2,579	1,897	1,830	1,837	111	91
Santa Ana River															
Bear Valley Mutual WC	30,794	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
Redlands Water Co			760							588	981	1,044	884	625	654
SBVWCD SAR Spreading	20,040	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
Subtotal	50,834	51,583	42,600	76,978	36,412	34,583	29,616	24,829	24,963	17,484	41,338	33,209	16,446	31,694	16,413
Imported Water Spreading															
Sweetwater basin	0	96	0	4	0	4,194	1,725	6,559	4,654	2,684	2,420	2,414	5,205	4,994	3,002
Badger Basin	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0
Waterman Basin	0	0	0	0	0	0	0	3,528	250	0	0	0	39	9,216	9,368
SBVWCD Santa Ana Basins	0	0	0	0	0	99	7,153	6,853	2,229	924	2,117	3,782	1,994	56	1,689
SBVWCD Mill Creek Basins							1,462	1,696					0		1,022
Subtotal	0	96	0	4	0	4,297	10,340	18,636	7,133	3,612	4,537	6,196	7,238	14,266	15,081

Streamflow Diversions	2010 [acre-ft]	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]	Avg. [acre-ft]
Lytle Creek															
Fontana Union WC	10,052	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	6,127
Mount Vernon WC	167	685	578	520	468	421	379	341	307	276	276	276	276	276	452
Rialto, City of	1,000	1,148	1,319	996	1,020	871	1,041	1,206	1,133	950	1,509	1,230	1,529	904	1,097
San Bernardino, City of	450	0	0	0	0	0	0	0	0	0	1,853	0	0	910	355
West Valley Water District	3,322	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	3,239
Subtotal	14,991	23,252	12,507	7,660	8,884	8,088	6,393	7,138	6,652	10,030	12,968	8,126	7,144	11,921	11,270
Mill Creek															
Redlands, City of	10,076	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	8,835
SBVWCD MC	8,891	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	6,403
Subtotal	18,967	29,677	10,751	8,775	5,545	4,992	5,457	11,515	7,816	14,974	11,418	7,486	7,195	28,710	15,238
Bunker Hill Creeks															
Arrowhead Water & Power West Twin Crk	40	46	46	41	46	46	46	47	47	47	47	47	47	47	46
Arrowhead Water & Power East Twin Crk	0	1,097	1,097	987	889	800	720	648	583	525	472	425	383	383	1,753
Devore Water Company Kimbark	56	78	37	33	62	62	62	62	62	62	62	62	62	62	61
Subtotal	96	1,221	1,180	1,062	997	908	828	757	692	634	581	534	491	492	1,859
Santa Ana River															
Bear Valley Mutual WC	7,000	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	15,017
Redlands Water Co	629	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	3,050
SBVWCD SAR Spreading	21,662	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	14,159
Subtotal	29,291	52,213	26,573	15,995	11,749	12,511	13,312	33,806	14,651	48,108	35,398	17,081	13,451	57,037	32,226
Imported Water Spreading															
Sweetwater basin	3,983	4,457	6,413	4,514	1,672	4,933	6,286	6,083	1,683	2,819	1,446	0	2	3,529	2,958
Badger Basin		1,649	2,875	404	0	0	3,429	3,322	466	0	0	0	0	442	450
Waterman Basin	12,499	10,667	14,089	7,533	0	4,543	12,799	19,108	9,902	22,480	5,316	0	0	11,516	5,271
SBVWCD Santa Ana Basins	14	1,515	603	2	19	61	5,399	22,087	3,608	19,327	0	0	0	7,768	3,010
SBVWCD Mill Creek Basins	665	711	510	0	0	0	500	3,916	468	10,643	171	0	0	7,986	1,653
Subtotal	17,161	18,999	24,490	12,453	1,691	9,537	28,413	54,516	16,127	55,269	6,933	0	2	31,241	13,341

Assumed as average and are provisional data.

Total = 73,935

'23 Total = 129,401

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 2022. 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 2023 was 37,003; 2,512; 17,549; 11,679 acre-feet respectively.