

Appendix A1b

Methodology for Estimating Existing Water Supply from Historical Water Deliveries Data

A1b.1 Overview

This appendix describes the process used to estimate existing water supply in each geographic region (Sacramento River watershed, Delta eastside tributaries, Delta, San Joaquin Valley, San Francisco Bay Area, Central Coast, and Southern California) based on data from the California Department of Water Resources (DWR)'s 2018 California Water Plan and other sources. It includes adjustments made to the raw data from DWR in order to both characterize the share of water originating in the Sacramento/Delta used in each region, and the quantity of Sacramento/Delta water used by category of use.

The California Water Plan is required under Water Code Section 10005(a). DWR updates the California Water Plan every 5 years, and the California Water Plan was last updated in 2018. Additional information regarding the California Water Plan can be accessed on DWR's website at: <https://water.ca.gov/programs/california-water-plan>.

A1b.2 California Department of Water Resources California Water Plan Datasheet

The California Water Plan existing water supply estimates presented in Section 2.8, *Existing Water Supply*, are calculations based on planning area data obtained from the 2018 California Water Plan. The estimates presented in Section 2.8 are annual average values for the period of 2005 to 2015 calculated from annual datasets in a DWR California Water Plan datasheet. The DWR California Water Plan datasheet that contains the data used is available from the State Water Board upon request. Within the California Water Plan datasheet, the following data fields were used:

- Agricultural groundwater use (denoted *Total GW Ag* in the California Water Plan datasheet)
- Municipal groundwater use (denoted *Total GW Urban* in the California Water Plan datasheet)
- Managed wetlands groundwater use (denoted *Total GW MW* in the California Water Plan datasheet)
- Total agricultural water supply (denoted *Total Supply Ag (includes Reuse)* in the California Water Plan datasheet)
- Total municipal water supply (denoted *Total Supply Urban (includes Reuse)* in the California Water Plan datasheet)
- Total managed wetlands water supply (denoted *Total Supply MW (includes Reuse)* in the California Water Plan datasheet)

The planning area data were summed to the regional level as follows:

- Sacramento River watershed: Planning Areas 501–509, 511
- Delta Eastside Tributaries: Planning Areas 603–604
- Delta: Planning Areas 510, 602
- San Francisco Bay Area: Planning Areas 201–202
- Central Coast: Planning Areas 301–302
- San Joaquin Valley: Planning Areas 601, 605–610, 701–710
- Southern California: Planning Areas 401–404, 901–905, 1001–1006

A1b.3 Central Valley Project and State Water Project Deliveries from the Sacramento/Delta

While the California Water Plan data identify water use in each region, the staff analysis seeks to isolate the portion of surface water that derives from the Sacramento/Delta. Attachment 1 to this appendix addresses this by presenting a summary of an analysis that involved tracking delivery volumes by the CVP and SWP to the export regions for the period 2005 through 2015. (Significant non-project water, such as from the Mokelumne River, was also included.)

Attachment 1 also summarizes an analysis conducted to determine the end use of the Sacramento/Delta water supplies. This effort determined the primary contractual designation of the project water as “agricultural,” “municipal and industrial,” or “refuge.”¹

Lastly, Attachment 1 discusses some adjustments made to the regional location and use of some surface water volumes. First, application of the California Sub-Regional Agricultural Analysis model determined that some wholesale “urban” use involved some retail or other contracted use by commercial agricultural customers, so some revision to the table volumes was necessary. Second, simplified analytical assumptions were made in the staff report to place certain end uses in only a single of two adjacent regions; the volume adjustments were small and did not affect the conclusions of the impact analysis.

A1b.4 Summary of Attachment 1 Analysis

The following page displays the foundational table reflecting the adjustments discussed above, which form the basis for the presentation of Historical Water Deliveries Data for the period of 2005 to 2015. Changes were made in the Total Supply Ag, Total Supply Urban, Total Non-GW Ag, and Total Non-GW Urban columns to reflect the revisions discussed above in the San Francisco Bay Area, Central Coast, and Southern California. All tables in Chapter 2, *Hydrology and Water Supply* (specifically Tables 2.8-1 through 2.8-10), derive from information in this table. The results carry through to other sections of the report that rely upon the Historical Water Deliveries Data, including

¹ In this appendix, “municipal and industrial” use is categorized in the tables as “urban,” and “refuge” as “managed wetlands.”

Chapter 6, *Changes in Hydrology and Water Supply* (Table 6.4-1 and text in Section 6.4, *Changes in Surface Water Supply*), and Section 7.4, *Agriculture and Forest Resources*.

Table 2.8-2 presents estimated average annual groundwater supply by geographic region and sector, based on data from the *Total GW Ag*, *Total GW Urban*, and *Total GW MW* data fields.

Table 2.8-1 presents estimated average annual surface water and other water supplies by geographic region and sector based on the difference between total water supply (including reuse) and total groundwater supply. The difference was calculated as follows and using the following data fields:

- Total Agricultural Surface Water and Other Water Supplies = Total Supply Ag (includes Reuse) – Total GW Ag
- Total Municipal Surface Water and Other Water Supplies = Total Supply Urban (includes Reuse) – Total GW Urban
- Total Managed Wetlands Surface Water and Other Water Supplies = Total Supply MW (includes Reuse) – Total GW MW

All values presented in Tables 2.8-1, 2.8-2, and subsequent tables are rounded to the nearest 1 thousand acre-foot.

Table A1b-1. Historical Water Deliveries Data—Total and Groundwater Use by Sector, 2005–2015 Annual Average

Region	Total Supply Ag (includes Reuse)	Total Supply Urban (includes Reuse)	Total Supply MW (includes Reuse)	Total Supply	Total GW Ag	Total GW Urban	Total GW MW	Total GW Use	Total Non-GW Ag	Total Non-GW Urban	Total Non-GW MW	Total Non-GW Supply
Sacramento River Watershed	6,773	826	451	8,050	2,272	387	20	2,679	451	439	431	5,371
Delta	1,185	136	48	1,368	34	40	0	74	1,151	96	48	1,294
Delta Eastside Tributaries Region	824	154	8	986	545	53	0	597	279	102	8	389
San Joaquin Valley	16,803	1,053	581	18,437	9,034	823	251	10,107	7,769	231	330	8,330
San Francisco Bay Area	137	1,089	26	1,251	80	184	0	264	57	905	26	987
Central Coast	1,055	279	0	1,334	968	196	0	1,164	87	83	0	170
Southern California	4,863	4,518	68	9,449	792	1,590	0	2,382	4,071	2,928	68	7,067

GW Ag = agricultural groundwater use; GW MW = managed wetlands groundwater use; GW Urban = municipal groundwater use.

Attachment A1b1

Compiling Historical Sacramento/Delta Water Supplies to San Joaquin Valley, Central Coast, Southern California, and San Francisco Bay Area Regions

This attachment aims to document estimation of historical Sacramento/Delta annual water supplies of each water use sector (Agricultural, Municipal, and Wetland) for the Staff Report Geographical Study Regions from Calendar Years (CY) 2005 to 2015. Sacramento/Delta supplies originate in or are diverted from surface waterbodies in the Sacramento River watershed, Delta eastside tributaries, and Delta regions. Sacramento/Delta average annual water supply estimates are needed for the Staff Report Section on Existing Water Supply, which discusses existing water supply and uses for the geographic regions as defined in the Staff Report. Published water supply data from the California Department of Water Resources (DWR), U.S. Bureau of Reclamation (Reclamation), and other agency documents are extracted to compile water supply values for CYs 2005 to 2015 for each study region.

A1b1.1 Historical CVP and SWP Deliveries from the Sacramento/Delta Water Supplies

While the California Water Plan data identify water use in each region, the staff analysis seeks to isolate the portion of surface water that derives from Sacramento/Delta. This section presents analyses for tracking delivery volumes by the CVP and SWP to the export regions (San Joaquin Valley, Central Coast, Southern California, and San Francisco Bay Area) for the period of 2005 through 2015. Significant non-project water, such as from the Mokelumne River, was also included.

The average annual Sacramento/Delta historical water supplies estimate into each of the four export regions (San Joaquin Valley, Central Coast, Southern California, and San Francisco Bay Area) via the CVP/SWP system and other systems during CYs 2005 to 2015 period is summarized in Table A1b1-1 below. All volumes are in thousands of acre-feet (TAF). Sections A1b1.1.1, *San Joaquin Valley Region*, through A1b1.1.4, *San Francisco Bay Area Region*, describe in greater detail the approach taken for each export region.

Table A1b1-1. Average Annual Sacramento/Delta Historical Water Supplies Estimate (thousands of acre-feet)

Region	CVP	SWP	Other	Total Supply Estimate
San Joaquin Valley	1,845	663	0	2,508
Central Coast	17	24	0	41
Southern California	0	1,261	0	1,261
San Francisco Bay Area	206	141	217	564

A1b1.1.1 San Joaquin Valley Region

1. **CVP Water Deliveries.** The calculations are on row 11 of the “Calcs Main” tab of the Sacramento/Delta Water Supplies Spreadsheet (SWRCB 2020). The estimate of total CVP average annual supply for the San Joaquin Valley region from all Sacramento/Delta supplies listed above is 1,845 TAF per year for the CY 2005 to 2015 period. Various supply components and calculations are as follows:
 - a. First component is CVP Base and Project deliveries to the California Water Plan’s San Joaquin River region. The source of data for this supply is row 38 of the “San Joaquin River” tab in the California Department of Water Resources (DWR)’s 2018 California Water Plan “donut” spreadsheet (DWR 2018a). This component has some supplies that will be subtracted because these do not originate from Sacramento/Delta.
 - b. The second component is CVP Base and Project deliveries to the Tulare Lake region. The source of data for this supply is row 38 of the “Tulare Lake” tab in the CWPU2018 “donut” spreadsheet (DWR 2018a). This component has some supplies that will be subtracted because these do not originate from Sacramento/Delta.
 - c. The third component is Folsom South Canal deliveries, which need to be subtracted because this supply is from the Sacramento River region to the Study Report’s Delta Eastside Tributaries region. The source of data for this supply is row 29 of the “statewide” tab in DWR’s Data for Regional Imports and Exports 2018 spreadsheet (DWR 2018b).
 - d. The fourth component is Kings River deliveries, which need to be subtracted because these are from the Tulare Lake region to San Joaquin River region. The source of data for this supply is row 37 of the “statewide” tab in DWR’s Data for Regional Imports and Exports 2018 spreadsheet (DWR 2018b).
 - e. The fifth component is New Melones CVP base and project deliveries, which need to be subtracted because these originate in the San Joaquin River region itself. The source of data for this supply is row 64 minus row 60 minus row 58 of the “TOTALS” tab in DWR’s New Melones CVP Base and Project Delivery spreadsheet (DWR 2020b).
 - f. The sixth component is Friant-Kern Canal deliveries, which also are subtracted because these originate in the Tulare Lake region. The source of data for this supply is the total value in Reclamation’s Central Valley Operations website, divided by 1,000 to convert to TAF (Reclamation 2005a).
 - g. The seventh component is Madera Canal and Millerton Lake deliveries, which are also subtracted because these originate from the Tulare Lake region. The source of data for this supply is sum of two total values in Reclamation’s Central Valley Operations website, divided by 1,000 to convert to TAF (Reclamation 2005b).
 - h. The last supply component to be subtracted is Friant-Kern deliveries to meet Exchange Contractors and refuge demands during 2014 and 2015 drought years. This portion is also subtracted because these originate from the Tulare Lake region. The source of data for this supply is an email correspondence with Westlands Water District staff (Boardman pers. comm.).
2. **SWP Water Deliveries:** The calculations are on rows 19 through 24 of the “Calcs Main” tab of the Sacramento/Delta Water Supplies Spreadsheet (SWRCB 2020). SWP Contractors in the San Joaquin River region (Oak Flat Water District, County of Kings, Dudley Ridge Water District,

Empire West Side Irrigation District, Kern County Water Agency, Tulare Lake Basin Water Storage District) receive many categories of water (Table A, Carryover, Turnback Pools, Article 21, and Other SWP). SWP average annual supplies for the San Joaquin River region for CYs 2005 to 2015 are 663 TAF per year.

- a. Table A: This supply is to meet the Contractor's long-term contracts. The source of data for this supply is cells B30, B80, B130, B180, B230, B280, B330, B380, B430, B480, and B530 of the "2005–2015 SWP DELIVERIES" tab in DWR's SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
- b. Carryover: This is the unused portion of a Contractor's Table A allocations in a given year, which is carried over for use in the following year. The source of data for this supply is cells C30, C80, C130, C180, C230, C280, C330, C380, C430, C480, and C530 of the "2005–2015 SWP DELIVERIES" tab in DWR's SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
- c. Turnback Pool: This is unused Table A water allocations, excess water available for sale to other SWP Contractors. The source of data for this supply is cells D30, D80, D130, D180, D230, D280, D330, D380, D430, D480, and D530 of the "2005–2015 SWP DELIVERIES" tab in DWR's SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
- d. Article 21: It allows Contractors to take deliveries above approved and scheduled Table A amounts offered predominantly in wet years under certain criteria; also called interruptible, unscheduled, or surplus water. The source of data for this supply is cells E30, E80, E130, E180, E230, E280, E330, E380, E430, E480, and E530 of the "2005–2015 SWP DELIVERIES" tab in DWR's SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
- e. Other SWP: The source of data for this supply is cells F30, F80, F130, F180, F230, F280, F330, F380, F430, F480, and F530 of the "2005–2015 SWP DELIVERIES" tab in DWR's SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).

The calculations are in cells M11 and M24 of the "Calcs Main" tab of the Sacramento/Delta Water Supplies Spreadsheet (SWRCB 2020).

A1b1.1.2 Central Coast Region

1. CVP Base and Project deliveries to Central Coast region. The source of data is San Benito deliveries from the Reclamation-Central Valley Operations Office (CVO) website for 2005 through 2015 (Reclamation 2005c, 2006a, 2007a, 2008a, 2009a, 2010a, 2011a, 2012a, 2013a, 2014a, and 2015a).

The average annual supplies are 16.9 TAF (SWRCB 2020).

2. SWP Contractors in the Central Coast region (San Luis Obispo County Flood Control and Water Conservation District, Santa Barbara County Flood Control and Water Conservation District) receive various water types (Table A, Carryover, Turnback Pools, Article 21, and Other SWP). The source of data for this supply is DWR's SWP 2005–2016 Historical Deliveries spreadsheet (average annual supplies = 23.9 TAF) (DWR 2020a).

The calculations are in cells M31 and M40 of the "Calcs Main" tab of the Sacramento/Delta Water Supplies Spreadsheet (SWRCB 2020).

A1b1.1.3 Southern California Region

SWP Contractors in the Southern California region (Antelope Valley-East Kern Water Agency, Santa Clarita Valley Water Agency, Coachella Valley Water District, Crestline-Lake Arrowhead Water Agency, Desert Water Agency, Littlerock Creek Irrigation District, Metropolitan Water District of Southern California, Mojave Water Agency, Palmdale Water District, San Bernardino Valley Municipal Water District, San Gabriel Valley Municipal Water District, San Geronio Pass Water Agency, Ventura County Watershed Protection District) receive various water types (Table A, Carryover, Turnback Pool, Article 21, and Other SWP).

1. Table A: The source of data for this supply is cells B49, B99, B149, B199, B249, B299, B349, B399, B449, B499, and B549 of the “2005–2015 SWP DELIVERIES” tab in DWR’s SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
2. Carryover: The source of data for this supply is cells C49, C99, C149, C199, C249, C299, C349, C399, C449, C499, and C549 of the “2005–2015 SWP DELIVERIES” tab in DWR’s SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
3. Turnback Pool: The source of data for this supply is cells D49, D99, D149, D199, D249, D299, D349, D399, D449, D499, and D549 of the “2005–2015 SWP DELIVERIES” tab in DWR’s SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
4. Article 21: The source of data for this supply is cells E49, E99, E149, E199, E249, E299, E349, E399, E449, E499, and E549 of the “2005–2015 SWP DELIVERIES” tab in DWR’s SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
5. Other SWP: The source of data for this supply is cells F49, F99, F149, F199, F249, F299, F349, F399, F449, F499, and F549 of the “2005–2015 SWP DELIVERIES” tab in DWR’s SWP 2005–2016 Historical Deliveries spreadsheet (DWR 2020a).
6. Kern River thru California Aqueduct: The source of data for this supply is cell P39 of the “statewide” tab in DWR’s Data for Regional Imports and Exports 2018 spreadsheet (DWR 2018b).

The calculations are in cell M51 of the “Calcs Main” tab of the Sacramento/Delta Water Supplies Spreadsheet (SWRCB 2020).

A1b1.1.4 San Francisco Bay Area Region

The San Francisco Bay Area region (Bay Area region) receives Sacramento/Delta supplies from several sources. These are Solano Project, Vallejo Permit Water, SWP North Bay Aqueduct (NBA), SWP South Bay Aqueduct (SBA), CVP’s Contra Costa Water District (CCWD), CVP’s San Felipe Unit, and East Bay Municipal Utility District (EBMUD).

The average annual Sacramento/Delta historical water supplies estimates from each of the imported sources into the Bay Area region during the CY 2005 to 2015 period are summarized below.

1. Solano Project via Putah South Canal is federal water originating from Lake Berryessa (Sacramento River Region). The source of data for this supply is Other Federal Deliveries (row 41) of the “San Francisco Bay” tab in DWR’s CWPU2018 “donut” spreadsheet (average annual supplies = 25 TAF) (DWR 2018a).

2. Vallejo Permit Water is Water Rights water that originates from the Delta area in the Sacramento River region and is conveyed through SWP's NBA. The source of data for this supply is City of Vallejo (row 11) of the "statewide" tab in DWR's Data for Regional Imports and Exports 2018 spreadsheet (average annual supplies = 4 TAF) (DWR 2018b).
3. SWP's NBA Deliveries: NBA Contractors' deliveries originate from the Delta area in the Sacramento River region and are conveyed through the NBA. The source of data is the "2005–2015 SWP DELIVERIES" tab in DWR's SWP 2005–2016 Historical Deliveries spreadsheet (average annual supplies = 33 TAF) (DWR 2020a).
4. SWP's SBA Deliveries: SBA Contractors' deliveries originate from the Delta area in the Sacramento River region and are first conveyed through the California Aqueduct and then the SBA. The source of data is the "2005–2015 SWP DELIVERIES" tab in DWR's SWP 2005–2016 Historical Deliveries spreadsheet (average annual supplies = 108 TAF) (DWR 2020a).
5. CVP's CCWD Deliveries: CCWD deliveries originate from the Delta area in the Sacramento River region and are conveyed through Contra Costa Canal. The source of data is the Reclamation-CVO website for 2005 through 2015 (Reclamation 2005d, 2006b, 2007b, 2008b, 2009b, 2010b, 2011b, 2012b, 2013b, 2014b, and 2015b).

The average annual supply is 113 TAF (SWRCB 2020).

6. CVP's San Felipe Unit: San Felipe Unit deliveries originate from the Delta area in the Sacramento River region, are first conveyed through California Aqueduct, and are stored in the San Luis Reservoir and then conveyed through Santa Clara Conduit to Santa Clara Valley Water District. The source of data is the Reclamation-CVO website for 2005 through 2015 (Reclamation 2005c, 2006a, 2007a, 2008a, 2009a, 2010a, 2011a, 2012a, 2013a, 2014a, and 2015a).

The average annual supply is 93 TAF (SWRCB 2020).

7. EBMUD Deliveries originate from the Delta Eastside Tributaries region and are conveyed through Mokelumne Aqueduct to the East Bay region of the Bay Area region. The source of data is EBMUD records received via an email (average annual supplies = 188 MGD) (Jain pers. comm.).

The calculations are in cell M11 of the "Calculation of Water Supply Est" tab of the Documenting historical Bay Area region Sacramento/Delta Water Supplies spreadsheet (SWRCB 2020). The estimate of total average annual supply for the Bay Area region from all Sacramento/Delta supplies listed above is 564 TAF per year for the CY 2005 to 2015 period.

A1b1.2 Delineating Water Use Sectors of Sacramento/Delta Supplies

This section aims to determine the end use of the Sacramento/Delta water supplies delineated in the previous section. This effort determined the primary contractual designation of the project water as agricultural, municipal and industrial,¹ and managed wetlands/refuges (MW/R). Listed below are

¹ For the purposes of this document, a reference to *municipal use* includes domestic and industrial uses unless otherwise specified. The terms *urban* and *municipal and industrial (M&I)* are also sometimes used in this document to generally reference municipal water supplies.

South-of-Delta (SOD) annual contractual obligations for CVP (Table A1b1-2) and SWP (Table A1b1-3). Note that the majority of CVP SOD contractual demands are in the San Joaquin Valley region, with smaller fractions in the Central Coast region and Bay Area region. CVP SOD agricultural contractual demands are about 87 percent, municipal about 5 percent, and MW/R (Level 2) makes up the remaining 8 percent. The CVP contract amounts for all CVP Contractors are available from the Reclamation-CVO website (Reclamation 2016).

For SWP SOD (including the NBA), Table A contractual entitlements make up about 75 percent municipal and 25 percent agricultural. All SWP Agricultural Contractors are in the San Joaquin Valley region. SWP Contractors annual Table A entitlements were received from DWR's SWP Analysis Office via email and are also available in DWR's Publication Bulletin 132-18 (DWR 2021).

Table A1b1-2. CVP South-of-Delta Contractual Amounts (thousand acre-feet)

	SFBA	SJVA	CCA	SCA	Total
Agricultural Service Contracts	23	1881	38	0	1942
Municipal Service Contracts	130	26	6	0	162
Exchange/Settlement (Water Rights Contracts)	0	876	0	0	876
Wetlands/Refuges Contracts (Level 2)	0	271	0	0	271
Total	153	3054	44	0	3251

CCA = Central Coast region; SCA = Southern California region; SFBA = San Francisco Bay Area region; SJVA = San Joaquin Valley region

Table A1b1-3. SWP South-of-Delta Table A Contractors Entitlements (thousand acre-feet)

	SFBA	SJVA	CCA	SCA	Total
Table A Agricultural	0	999	0	0	999
Table A Municipal	300	135	70	2,630	3,135
Total	300	1,134	70	2,630	4,134

CCA = Central Coast region; SCA = Southern California region; SFBA = San Francisco Bay Area region; SJVA = San Joaquin Valley region

A1b1.2.1 Disaggregation of Average Annual Historical Water Supplies into Water Use Sectors

Table A1b1-1 in Section A1b1.1, *Historical CVP and SWP Deliveries from the Sacramento/Delta Water Supplies*, summarizes estimated historical average annual Sacramento/Delta supplies exported during the 2005 to 2015 period into each of the four export regions. In this section, the methodology used to disaggregate estimated total water supplies into three water use sectors of agricultural, municipal, and MW/R is briefly discussed.

CVP SOD annual water supplies are based on a tiered water allocation procedure. Water Rights/Exchange Contractors and MW/R contracts have the highest priority. These are solely based on Shasta Inflow criteria. MW/R supplies are set at 100 percent most years and go down to 75 percent under lower Shasta inflow conditions; however, under extreme dry conditions they may be further reduced. CVP SOD Water Service Contractors have a lower priority than Water Rights/Exchange Contractors and MW/R. The Service Contracts have two types of water, agricultural and municipal, as listed in Table A1b1-2 above. The municipal portion of Service Contracts has a higher priority than agricultural. Under drier water availability conditions, first cut is applied to Agricultural

Service contracts up to 50 percent of their contract amounts. In general, any further cuts are applied equally to agricultural and municipal portions. Annual water allocations each year are based upon forecasted available water supply including storage and other in-basin obligations. Each year as the water supply conditions develop, the allocations for various water types are updated starting in February through May in most years, with some exceptions. The historical water supply allocation percentages for various water types are available from the Reclamation-CVO website (Reclamation 2025). For purposes of estimating water quantities for each water use sector, final allocation percentages for each water type were taken from the CVO Historical Water Supply Allocation tables and are listed below in Table A1b1-4.

Table A1b1-4. CVP Historical Water Allocations in Percent (2005–2015)^a

Year	Water Rights/Exchanges and Wetlands/Refuges	Municipal Service	Agricultural Service
2005	100	100	85
2006	100	100	100
2007	100	75	50
2008	100	75	40
2009	100	60	10
2010	100	75	45
2011	100	100	80
2012	100	75	40
2013	100	70	20
2014	65	50	0
2015	75	25	0
Average Annual Allocations (%)	95	73	43

^a Under certain extremely dry hydrologic conditions in the Sacramento/Delta or very wet in the export regions (San Joaquin Valley region, Bay Area region, Central Coast region and Southern California region), actual deliveries may differ from what annual allocation percentage may entail.

As shown in Table A1b1-4 above, CVP's Municipal Service Contractors received an average of 73 percent of their contract amount for the 11-year period of 2005 to 2015. The export region's Municipal Service Contract amount listed in Table A1b1-2 was multiplied with average annual allocation of 73 percent to estimate average historical water supply for the municipal sector. The estimated municipal sector supplies were subtracted from the total estimated water supplies of the region to come up with remaining supplies for the agricultural and MW/R sectors.

Reclamation-CVO staff has also provided historical data for MW/R for each year (Refuge Water Delivery Table 1993 to 2019) (DWR 2020c). These data were more accurate and were used instead of historical allocations for computing average annual water supply for MW/R for the San Joaquin Valley region.

As discussed earlier, SWP Contractors entitlements have only municipal and agricultural water use contracts and no MW/R contracts. Furthermore, there is only one SWP Contractor, Kern County Water Agency, in the San Joaquin Valley region, which has both municipal and agricultural components. All remaining SWP Contractors are municipal use only. It is noted that for SWP, allocations between agricultural and municipal water use sectors have identical priority. For the San Joaquin Valley region the agricultural use sector quantity was computed by multiplying estimated

average annual historical deliveries for Kern County Water Agency by ratio of its Table A agricultural entitlements to Table A total entitlements.

For the Bay Area region, export supplies originating from Sacramento/Delta regions are municipal water use sector with one exception: supply from CVP's San Felipe Unit has an agricultural component as shown in Table A1b1-2. Estimated historical supplies from this source were split into the municipal sector in the same way as for the San Joaquin Valley region as discussed earlier.

Similarly, for the Central Coast region, to arrive at CVP's municipal portion from its San Felipe Unit water supplies, the methodology used was the same as in the San Joaquin Valley region.

Table A1b1-5 below summarizes estimated disaggregated water supplies for each water use sector for the four export regions.

Table A1b1-5. Estimates of Disaggregated Average Annual Sacramento/Delta Supplies for Each Water Use Sector (thousand acre-feet), 2005 to 2015

Sector	SFBA	SJVA	SCA	CCA	Total
Agricultural	10	2,165	0	14	2,189
Municipal	554	98	1,261	27	1,940
Wetland	0	245	0	0	245
Total	564	2,508	1,261	41	4,374
Total CVP supplies	206	1,845	0	17	2,068
Total SWP supplies	141	663	1,261	24	2,089
Other	217	0	0	0	217

CCA = Central Coast region; SCA = Southern California region; SFBA = San Francisco Bay Area region; SJVA = San Joaquin Valley region

A1b1.3 Adjustments to California Water Plan Regional Estimates Based on California Sub-Regional Agricultural Analysis and Consistency in Analysis

This section provides a summary of the changes to the analysis of historic Sacramento/Delta water supplies to the export regions of the San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California discussed in Sections A1b1.1, *Historical CVP and SWP Deliveries from the Sacramento/Delta Water Supplies*, and A1b1.2, *Delineating Water Use Sectors of Sacramento/Delta Supplies*. Earlier analysis was conducted at a broad analytical scale and prior to (1) completion of the Sacramento Water Allocation Model (SacWAM) results, and (2) consideration of water use (agricultural versus municipal) at the retail level. In addition, certain adjustments to categorized use or region are necessary in order to provide consistency with the analytical framework of the Staff Report's environmental impact analysis. These adjustments are discussed below.

A1b1.3.1 Summary of Adjustments

The following list provides an overview of the changes to the analysis of California Water Plan data and follow-up analysis discussed in Sections A1b1.1, *Historical CVP and SWP Deliveries from the*

Sacramento/Delta Water Supplies, and A1b1.2, Delineating Water Use Sectors of Sacramento/Delta Supplies.

1. San Francisco Bay Area

- a. Solano Irrigation District diversion through the South Putah Canal is considered agricultural irrigation supply, modeled as the A_SIDSH_NA demand node in SacWAM. Requires an increase of 25 TAF for agriculture and a decrease of 25 TAF in municipal.
- b. The NBA provides SWP water to subcontractors of the Solano County Water Agency, including Vacaville. In addition, the California State Prison System (CSPS) receives water from the NBA. Both Vacaville and CSPS are modeled in the Sacramento River Basin, reducing the municipal volume by 8,000 (approximately 7,000 for Vacaville [[^]City of Vacaville 2016, Table 6–9] and 1,000 for CSPS).
- c. The San Felipe Unit of the CVP for agriculture is considered in the Central Coast in the Staff Report environmental analysis and requires moving 10 TAF from agriculture in the Bay Area region to the Central Coast region.
- d. Zone 7, a regional water provider, receives SWP water by the SBA. Although primarily a municipal provider, Zone 7 also delivers approximately 8 TAF to agricultural irrigators. To account for this, 8 TAF must be shifted from municipal to agriculture.

2. Central Coast

- a. Agriculture served by CVP's San Felipe Unit is physically located in both the Bay Area region and Central Coast region, but for analysis purposes in the Staff Report all lands are considered as part of the Central Coast region. This increases the agriculture use by 10 TAF (see also 1.c above).
- b. Several water districts in the Santa Barbara area provide SWP water to agricultural irrigators as a share of comingled surface water sources. Approximately 1 TAF is shifted from municipal to agricultural uses.

3. Southern California

- a. Metropolitan Water District of Southern California is a wholesale water agency providing SWP and Colorado River water to 26 regional water providers and municipalities. Four regional providers serve agricultural irrigators among their customer base, with an estimated 14 TAF of irrigation derived from Sacramento/Delta sources. Accounting for this involves a shift of 14 TAF from the municipal use category to agriculture.

4. San Joaquin Valley

- a. No changes.

5. Four-Region Total

- a. The aggregate total for the four export regions (Bay Area region, Central Coast region, San Joaquin Valley region, and Southern California region) will decrease by 8 TAF, with the Sacramento River Basin increasing by 8 TAF resulting from a change in assignment of SWP water to Vacaville and CSPS (see 1.b above).

Implementing the adjustments noted above will result in minor changes to Table A1b1-1 in Section A1b1.1, *Historical CVP and SWP Deliveries from the Sacramento/Delta Water Supplies*. For the supply estimates, three changes are necessary:

1. Decrease San Francisco Bay Area by 8 TAF (see 1.b above)
2. Decrease San Francisco Bay Area by an additional 10 TAF (see 1.c above)
3. Increase Central Coast by 10 TAF (see 2.a above)

Table A1b1-1 (Revised). Average Annual Sacramento/Delta Historical Water Supplies Estimate (thousand acre-feet)

Region	CVP	SWP	Other	Total Supply Estimate
San Joaquin Valley	1,845	663	0	2,508
Central Coast	27	24	0	51
Southern California	0	1,261	0	1,261
San Francisco Bay Area	196	133	217	546

Table A1b1-5 in Section A1b1.2, *Delineating Water Use Sectors of Sacramento/Delta Supplies*, of this document provides a summary of the estimates of historical average annual Sacramento/Delta supplies for each water use sector for 2005 to 2015. Implementing the adjustments noted above will result in a revised Table A1b1-5 as shown below.

Table A1b1-5 (Revised). Estimates of Disaggregated Average Annual Sacramento/Delta Supplies for Each Water Use Sector (thousand acre-feet), 2005 to 2015

Sector	SFBA	SJVA	SCA	CCA	Total
Agricultural	33	2,165	14	24	2,236
Municipal	513	98	1,247	27	1,885
Wetland	0	245	0	0	245
Total	546	2,508	1,261	51	4,366
Total CVP supplies	196	1,845	0	27	2,068
Total SWP supplies	133	663	1,261	24	2,081
Other	217	0	0	0	217

CCA = Central Coast region; SCA = Southern California region; SFBA = San Francisco Bay Area region; SJVA = San Joaquin Valley region

A1b1.3.2 Changes to Chapter 2 Presentation of Historical Water Deliveries Summary 2005 to 2015

Table A1b1-6 displays the foundational table that forms the basis for the presentation of historical water deliveries estimates for the period of 2005 to 2015. The first portion presents the results of the original analysis. The second portion provides a summary of the changes to reflect adjustments identified above. The third portion displays the resulting foundational table after the adjustments are included. All tables in Chapter 2, *Hydrology and Water Supply* (specifically Tables 2.8-1 through 2.8-10), derive from the third (“Revised”) portion of Table A1b1-6.

The results in the third portion of Table A1b1-6 are also carried through to other sections of the report that rely upon the summary of the California Water Plan, including Chapter 6, *Changes in Hydrology and Water Supply* (Table 6.4-1 and text in Section 6.4, *Changes in Surface Water Supply*), and Section 7.4, *Agriculture and Forest Resources*.

Table A1b1-6. Historical Water Deliveries Data – Total and Groundwater Use by Sector, 2005–2015 Annual Average

Region	Total Supply Ag (includes Reuse)	Total Supply Urban (includes Reuse)	Total Supply MW (includes Reuse)	Total Supply	Total GW Ag	Total GW Urban	Total GW MW	Total GW Use	Total Non-GW Ag	Total Non-GW Urban	Total Non-GW MW	Total Non-GW Supply
Original												
Sacramento River Watershed	6,773	818	451	8,042	2,272	387	20	2,679	4,501	431	431	5,363
Delta	1,185	136	48	1,368	34	40	0	74	1,151	96	48	1,294
Delta Eastside Tributaries Region	824	154	8	986	545	53	0	597	279	102	8	389
San Joaquin Valley	16,803	1,053	581	18,437	9,034	823	251	10,107	7,769	234	330	8,329
San Francisco Bay Area	114	1,130	26	1,269	80	184	0	264	34	946	26	1,005
Central Coast	1,044	280	0	1,324	968	196	0	1,164	76	84	0	160
Southern California	4,849	4,532	68	9,449	792	1,590	0	2,382	4,057	2,942	68	7,067
Changes Based on Supply Estimates by Sector												
Sacramento River Watershed	0	8	0	8	0	0	0	0	0	8	0	8
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta Eastside Tributaries Region	0	0	0	0	0	0	0	0	0	0	0	0
San Joaquin Valley	0	0	0	0	0	0	0	0	0	0	0	0
San Francisco Bay Area	23	-41	0	-18	0	0	0	0	23	-41	0	-18
Central Coast	11	-1	0	10	0	0	0	0	11	-1	0	10
Southern California	14	-14	0	0	0	0	0	0	14	-14	0	0
Revised												
Sacramento River Watershed	6,773	826	451	8,050	2,272	387	20	2,679	4,501	436	431	5,371
Delta	1,185	136	48	1,368	34	40	0	74	1,151	96	48	1,294
Delta Eastside Tributaries Region	824	154	8	986	545	53	0	597	279	102	8	389
San Joaquin Valley	16,803	1,053	581	18,437	9,034	823	251	10,107	7,769	231	330	8,330

Region	Total Supply Ag (includes Reuse)	Total Supply Urban (includes Reuse)	Total Supply MW (includes Reuse)	Total Supply	Total GW Ag	Total GW Urban	Total GW MW	Total GW Use	Total Non- GW Ag	Total Non-GW Urban	Total Non-GW MW	Total Non-GW Supply
San Francisco Bay Area	137	1,089	26	1,251	80	184	0	264	57	905	26	987
Central Coast	1,055	279	0	1,334	968	196	0	1,164	87	83	0	170
Southern California	4,863	4,518	68	9,449	792	1,590	0	2,382	4,071	2,928	68	7,067

GW Ag = agricultural groundwater use; GW MW = managed wetlands groundwater use; GW Urban = municipal groundwater use

A1b1.4 References

A1b1.4.1 Common References

^City of Vacaville. 2016. *Urban Water Management Plan Update*. July.

A1b1.4.2 Section References

California Department of Water Resources (DWR). 2018a. 1998-2016 Water Usage and Supplies for California Hydrologic Regions “donut” Spreadsheet.

California Department of Water Resources (DWR). 2018b. 1998-2015 CVP and SWP Regional Imports and Exports Data Spreadsheet.

California Department of Water Resources (DWR). 2020a. 2005–2016 SWP Historical Deliveries Spreadsheet.

California Department of Water Resources (DWR). 2020b. 2005-2015 CVP New Melones Base and Project Delivery Spreadsheet.

California Department of Water Resources (DWR). 2020c. 1992 to 2019 CVP Refuge Water Delivery Spreadsheet.

California Department of Water Resources (DWR). 2021. *Management of the California State Water Project*. Bulletin 132-18.

State Water Resources Control Board (SWRCB). 2020. 2005-2015 Sacramento/Delta Water Supplies Spreadsheet.

U.S. Bureau of Reclamation (Reclamation). 2005a. Central Valley Operations – 2005 Water Delivery Monthly Tables. *Friant-Kern Canal Deliveries (Table 22)*. Available: <https://www.usbr.gov/mp/cvo/05deliv.html>.

U.S. Bureau of Reclamation (Reclamation). 2005b. Central Valley Operations – 2005 Water Delivery Monthly Tables. *Madera Canal and Millerton Lake Deliveries (Table 23)*. Available: <https://www.usbr.gov/mp/cvo/05deliv.html>.

U.S. Bureau of Reclamation (Reclamation). 2005c. Central Valley Operations – 2005 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available: <https://www.usbr.gov/mp/cvo/05deliv.html>.

U.S. Bureau of Reclamation (Reclamation). 2005d. Central Valley Operations – 2005 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available: <https://www.usbr.gov/mp/cvo/vungvari/tab2105.prn>.

U.S. Bureau of Reclamation (Reclamation). 2006a. Central Valley Operations – 2006 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available: <https://www.usbr.gov/mp/cvo/06deliv.html>.

- U.S. Bureau of Reclamation (Reclamation). 2006b. Central Valley Operations – 2006 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available:
<https://www.usbr.gov/mp/cvo/vungvari/tab2106.prn>.
- U.S. Bureau of Reclamation (Reclamation). 2007a. Central Valley Operations – 2007 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available:
<https://www.usbr.gov/mp/cvo/07deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2007b. Central Valley Operations – 2007 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available:
<https://www.usbr.gov/mp/cvo/vungvari/tab2107.prn>.
- U.S. Bureau of Reclamation (Reclamation). 2008a. Central Valley Operations – 2008 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available:
<https://www.usbr.gov/mp/cvo/08deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2008b. Central Valley Operations – 2008 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available:
<https://www.usbr.gov/mp/cvo/vungvari/tab2108.prn>.
- U.S. Bureau of Reclamation (Reclamation). 2009a. Central Valley Operations – 2009 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available:
<https://www.usbr.gov/mp/cvo/09deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2009b. Central Valley Operations – 2009 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available:
<https://www.usbr.gov/mp/cvo/vungvari/tab2109.prn>.
- U.S. Bureau of Reclamation (Reclamation). 2010a. Central Valley Operations – 2010 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available:
<https://www.usbr.gov/mp/cvo/10deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2010b. Central Valley Operations – 2010 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available:
<https://www.usbr.gov/mp/cvo/vungvari/tab2110.prn>.
- U.S. Bureau of Reclamation (Reclamation). 2011a. Central Valley Operations – 2011 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available:
<https://www.usbr.gov/mp/cvo/11deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2011b. Central Valley Operations – 2011 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available:
https://www.usbr.gov/mp/cvo/vungvari/table_21_2011.pdf.
- U.S. Bureau of Reclamation (Reclamation). 2012a. Central Valley Operations – 2012 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available:
<https://www.usbr.gov/mp/cvo/12deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2012b. Central Valley Operations – 2012 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available:
https://www.usbr.gov/mp/cvo/vungvari/table_21_2012.pdf.

- U.S. Bureau of Reclamation (Reclamation). 2013a. Central Valley Operations – 2013 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available: <https://www.usbr.gov/mp/cvo/13deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2013b. Central Valley Operations – 2013 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available: https://www.usbr.gov/mp/cvo/vungvari/table_21_2013.pdf.
- U.S. Bureau of Reclamation (Reclamation). 2014a. Central Valley Operations – 2014 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available: <https://www.usbr.gov/mp/cvo/14deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2014b. Central Valley Operations – 2014 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available: https://www.usbr.gov/mp/cvo/vungvari/table_21_2014.pdf.
- U.S. Bureau of Reclamation (Reclamation). 2015a. Central Valley Operations – 2015 Water Delivery Monthly Tables. *San Luis and Cross Valley Canal Deliveries (Table 26)*. Available: <https://www.usbr.gov/mp/cvo/15deliv.html>.
- U.S. Bureau of Reclamation (Reclamation). 2015b. Central Valley Operations – 2015 Water Delivery Monthly Tables. *Central Valley Project Diversions (Table 21)*. Available: https://www.usbr.gov/mp/cvo/vungvari/table_21_2015.pdf.
- U.S. Bureau of Reclamation (Reclamation). 2016. *Central Valley Project (CVP) Water Contractors*. Available: <https://www.usbr.gov/mp/cvp-water/docs/latest-water-contractors.pdf>.
- U.S. Bureau of Reclamation (Reclamation). 2025. *Summary of Water Supply Allocations*. Available: https://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf.

A1b1.4.3 Personal Communications

- Boardman, Tom. Westland's Water District. September 10, 2020—Email exchange regarding the Exchange Contractors call on the Friant water in 2014-2025, last 2 years of recent drought.
- Jain, Priyanka PE. Senior Civil Engineer. East Bay Municipal Utility District (EBMUD). October 13, 2020—Email follow-up to meeting on San Francisco Bay Area region water supplies estimation.