

Memorandum

Date: March 18, 2018

To: 1. Erik Reyes, Chief
Central Valley Modeling Section
2. Tara Smith, Chief
Modeling Support Branch

From: Sina Darabzand
Senior Engineer Water Resources
Central Valley Modeling Section

Nazrul Islam
Senior Engineer Water Resources
Central Valley Modeling Section

Subject: The Final State Water Project Delivery Capability Report 2017

The attached report, "The Final State Water Project Delivery Capability Report 2017" (Final DCR 2017), is submitted for your review and approval to print multiple copies for public distribution in compliance with the requirements of Attachment B to the Monterey Plus Settlement Agreement of May 2003.

No comments were received during the public comment period that ended January 19th, 2018, and except for minor changes in formatting and the cover photo, the report contains the same material as was presented in "The State Water Project Draft Delivery Capability Report 2017", December 15th, 2017.

This page intentionally left blank.

The Final State Water Project Delivery Capability Report 2017

March 2018



State of California
Natural Resources Agency
Department of Water Resources

This page intentionally left blank.

State of California
Edmund G. Brown Jr., Governor

Natural Resources Agency
John Laird, Secretary for Resources

Department of Water Resources
Grant Davis, Director

Cindy Messer
Chief Deputy Director

Kasey Schimke
Asst. Director
Legislative Affairs Office

Erin Mellon
Asst. Director
Public Affairs Office

Spencer Kenner
Office of the Chief Counsel

Eric Koch
Acting Deputy Director
Integrated Water
Management

Christy Jones
Deputy Director Security and
Emergency
Management Program

Kathie Kishaba
Deputy Director
Business Operations

Jim Spence
Acting Deputy Director
California Energy Resources
Scheduling

Joel Ledesma
Deputy Director
State Water Project

Taryn Ravazzini
Deputy Director
Special Initiatives

Bay-Delta Office
Francis Chung, Chief
Modeling Support Branch
Tara Smith, Chief

**This report was prepared under the supervision of
Erik Reyes, Chief, Central Valley Modeling Section**

This report was prepared by
Sina Darabzand, Senior Engineer, WR, Central Valley Modeling Section
Nazrul Islam, Senior Engineer, WR, Central Valley Modeling Section

Individuals contributing to the development of the report
Ali Abrishamchi, Engineer, WR, Central Valley Modeling Section
Raymond Hoang, Engineer, WR, Central Valley Modeling Section
Christopher Quan, Engineer, WR, Central Valley Modeling Section
Gardner Jones, Program Manager I, Executive Program Office
Timothy Smith, Program Manager II, Executive Program Office
**Kristina Reese, Senior Environmental Scientist (Supervisory), Division of
Environmental Services**
**Emmanuel Asinas, Research Program Manager III, Division of Statewide Integrated
Water Management**
**Salma Kibrya, Research Program Specialist II, Division of Statewide Integrated Water
Management**
**Gholam Shakoori, Senior Environmental Scientist (SPEC), Division of Statewide
Integrated Water Management**
Sean Bagheban, Supervising Engineer, WR, Division of Flood Management
Michelle Morrow, Assistant Chief Council, Office of the Chief Counsel
Linda Ackley, Attorney IV, Office of the Chief Counsel
Robin McGinnis, Attorney, Office of the Chief Counsel

List of Acronyms

ANN (Artificial Neural Network)
 BDCP (Bay Delta Conservation Plan)
 BiOps (Biological Opinions)
 CEQA (California Environmental Quality Act)
 CESA (California Endangered Species Act)
 CDFW (California Department of Fish and Wildlife)
 CVP (Central Valley Project)
 CY (Calendar Year)
 D-1641 (State Water Board's Water Right Decision 1641 (D-1641), issued in December 1999 and updated in March 2000)
 DKIP (Delta Knowledge Improvement Program)
 DLIS (Delta Levees Investment Strategy)
 DO (Dissolved oxygen)
 DRMS (Delta Risk Management Strategy)
 DSM2 (Delta Simulation Model 2)
 E/I (Delta Exports to Inflow ratio)
 EcoRestore (Governor Brown's Delta habitat restoration plan)
 EIR (Environmental Impact Report)
 EIS (Environmental Impact Statement)
 ESA (Endangered Species Act)
 FCWCD (Flood Control and Water Conservation District)
 HCP (Habitat Conservation Plan)
 ID (Irrigation District)
 KCWA (Kern County Water Agency)
 M&I (Municipal and Industrial)
 MWDSC (Metropolitan Water District of Southern California)
 NCCP (Natural Community Conservation Plan)
 NEPA (National Environmental Policy Act)
 NMFS (National Marine Fisheries Service)
 NOD (Notice of Determination)
 OAL (The State Office of Administrative Law)
 ROD (Record of Decision)
 RPA (Reasonable and Prudent Alternative)
 SED (Substitute Environmental Document)
 SWC (State Water Contractors)
 SWP (State Water Project)
 SWPAO (State Water Project Analysis Office)
 SWRCB (State Water Resources Control Board)
 USBR (United States Bureau of Reclamation)
 USFWS (United States Fish and Wildlife Service)
 UWMP (Urban Water Management Plan)
 WaterFix (The water transfer component of the Bay Delta Conservation Plan)
 WD (Water District)
 WSD (Water Storage District)
 WSI-DI (Water Supply Index vs. Demand Index Relationship)
 WQCP (Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta)
 WY (Water Year)
 X2 (The distance in kilometers from Golden Gate, where salinity concentration in the Delta is 2 parts per thousand)

This page intentionally left blank.

Table of Contents

List of Tables	vi
List of Figures	vii
Summary	1
Section 1: Reasons to Assess SWP Water Delivery Capability	3
Population Growth, Land Use, and Water Supply.....	3
Legislation on Ensuring a Reliable Water Supply	3
Urban Water Management Planning Act	3
Water Conservation Act.....	4
Section 2: Regulatory Restrictions on SWP Delta Exports	5
Biological Opinions on Effects of Coordinated SWP and CVP Operations.....	5
Delta Inflows	7
Water Quality Objectives	8
Section 3: Ongoing Environmental and Policy Planning Efforts	10
Delta Plan	10
Bay Delta Conservation Plan (BDCP)/California WaterFix	11
Biological Opinions for CA WaterFix.....	12
EcoRestore	12
Section 4: State Water Project Historical Delivery Capability (2007-2016).....	14
Section 5: Existing SWP Water Delivery Capability (2017)	18
Hydrologic Sequence	18
Water Year Type Definition	18
Existing Demand for Delta Water.....	19
SWP Table A Water Demands	19

SWP Article 21 Water Demands.....20

Estimates of SWP Table A Water Deliveries21

 Wet-Year Deliveries of SWP Table A Water23

 Dry-Year Deliveries of SWP Table A Water24

Estimates of SWP Article 21 Water Deliveries26

 Wet-Year Deliveries of SWP Article 21 Water27

 Dry-Year Deliveries of SWP Article 21 Water.....28

Section 6: Historical SWP Delivery Tables for 2007-2016.....29

List of Tables

Table 4-1. Maximum Annual SWP Table A Water Delivery Amounts for SWP Contractors	15
Table 5-1. Water year types used in the Sacramento River Index.....	19
Table 5-2. Comparison of Estimated Average, Maximum, and Minimum Demands for SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year)	20
Table 5-3. Comparison of Estimated Average, Maximum, and Minimum Deliveries of SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year)	21
Table 5-4. Estimated Average and Wet-Period Deliveries of SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year), and Percent of Maximum SWP Table A Amount, 4,133 taf/year	24
Table 5-5. Estimated Average and Dry-Period Deliveries of SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year), and Percent of Maximum SWP Table A Amount, 4,133 taf/year	25
Table 5-6. Estimated Average and Wet-Period Deliveries of SWP Article 21 Water (Existing Conditions, in taf/year).....	27
Table 5-7. Estimated Average and Dry-Period Deliveries of SWP Article 21 Water (Existing Conditions, in taf/year).....	28
Table 6–1. Historical State Water Project Deliveries, Calendar Year 2007	30
Table 6–2. Historical State Water Project Deliveries, Calendar Year 2008	31
Table 6–3. Historical State Water Project Deliveries, Calendar Year 2009	32
Table 6–4. Historical State Water Project Deliveries, Calendar Year 2010	33
Table 6–5. Historical State Water Project Deliveries, Calendar Year 2011	34
Table 6–6. Historical State Water Project Deliveries, Calendar Year 2012	35
Table 6–7. Historical State Water Project Deliveries, Calendar Year 2013	36
Table 6–8. Historical State Water Project Deliveries, Calendar Year 2014	37
Table 6–9. Historical State Water Project Deliveries, Calendar Year 2015	38
Table 6–10. Historical State Water Project Deliveries, Calendar Year 2016	39

List of Figures

Figure 4-1. Historical Deliveries of SWP Table A Water, 2007–2016.....	16
Figure 4-2. Total Historical SWP Deliveries, 2007–2016 (by Delivery Type).....	17
Figure 5-1. SWP Article 21 Demands during Non–Kern Wet Years and Kern Wet Years (Existing Conditions).....	22
Figure 5-2. Estimated Likelihood of SWP Table A Water Deliveries, by Increments of 500 taf (Excluding Butte County and Yuba City)	23
Figure 5-3. Estimated Wet-Period SWP Table A Water Deliveries (Excluding Butte County and Yuba City)	24
Figure 5-4. Estimated Dry-Period SWP Table A Water Deliveries (Excluding Butte County and Yuba City)	25
Figure 5-5. Estimated Range of Monthly Deliveries of SWP Article 21 Water (Existing Conditions)	26
Figure 5-6. Estimated Likelihood of Annual Deliveries of SWP Article 21 Water (Existing Conditions)	27

This page intentionally left blank.

Summary

This report is intended for public information about the key factors affecting the operation of the State Water Project (SWP) system in California, its long-term reliability as a source of water for beneficial use, and an estimate of its current delivery capability.

Water provided by the SWP is a major component of the water supplies available to many SWP Contractors. State Water Contractors (SWC) consists of 29 legal entities that include cities, counties, urban water agencies, and agricultural irrigation districts. SWC's local/regional water users have long term contracts with the California Department of Water Resources (DWR) for all, or a portion of their water supply needs. Thus, the reliability of water from the SWP system is an important component in the water supply planning of its recipients, and ultimately affects the amount of water available for beneficial use in California.

The availability of these water supplies may be highly variable. A sequence of relatively wet water years¹ may be followed by a varying sequence of dry or critically dry years. Having good and reliable estimates on how much water each water user under contract with DWR will receive in a given year—whether it be a wet water year, a critical year, or somewhere in between—gives Contractors a better sense of the degree to which they may need to implement increased conservation measures, or plan for new additional, or back up sources of water to meet their needs.

The geography of California, and infrastructure of water transfer from the source areas, located in the Sierra Mountain Range, to areas of demand for water makes the Sacramento-San Joaquin Delta, a key feature of the SWP's ability to deliver water to its agricultural and urban Contractors in the North Bay, the South Bay, California Central Valley, and Southern California. All but five of the 29 SWP Contractors receive water deliveries by diversions from the Delta. These water diversions are pumped by either the Harvey O. Banks or Barker Slough pumping plants.

DWR, and the United States Bureau of Reclamation (USBR), the managing entities of the two statewide systems of water transfer in California, face numerous challenges in the operation of their diversion facilities in the Delta, and are regulated by several state and federal agencies to maintain, and enhance the Delta's long-term sustainability.

Maintaining suitable quality of water flowing in the channels of the Delta for the numerous in-basin beneficial uses, and the protection of endangered and threatened fish species, are important factors of concern for the operators of the Delta export diversion facilities. Ongoing regulatory restrictions, such as those aimed at protecting the estuary's resident and migratory fish species are major challenges to a reliable, and at the same time, sustainable water delivery capability of both, SWP and the CVP systems.

Complications induced by climate change also pose the threat of increased variability in floods and droughts, and the projected sea level rise, caused by the increase in

¹ Water years start on October 1 and end on September 30 of the next year. It is the time period where precipitation totals are measured

average temperature, complicate efforts to manage salinity levels in the channels below tide level. This could result in more frequent water quality degradation in the Delta channels.

Among the other challenges are continued subsidence of Delta islands, many of which are already below sea level, maintained by relatively unstable levee system, and the related threat of a catastrophic levee failure as water pressure increases on fragile levees.

The analyses in this report, factor in all of the current regulations governing SWP and CVP operations in the Delta and upstream, and assumptions about water uses upstream in the Sacramento River and San Joaquin River watersheds.

Analyses were conducted that considered the amounts of water that SWP Contractors use, and the amounts of water they choose to hold for use in a subsequent year.

Many of the same specific assumptions on SWP operations described in the *State Water Project Delivery Capability Report 2015* remain the same in this update for 2017. Most notably, the effects on the timing and the amount of SWP and CVP Delta diversions, by operating the system to meet the constraints spelled out in the 2008 and 2009 federal biological opinions (BiOps). Hence, the differences between the 2015 and 2017 reports can be attributed primarily to inputs on operating assumptions that result in a realistic simulation study, with the least amount of foresight on the historical hydrology (October 1921-September 2003) used in the simulation.

SWP Delta exports have decreased since 2005, although the bulk of the change occurred by 2009 as the federal BiOps went into effect, restricting operations of the CVP and SWP diversion pumps. The most salient findings in this report are as follows:

- Under existing conditions, the average annual delivery of Table A water estimated for this 2017 Report is 2,571 taf/year, 21 taf more than the 2,550 taf/year estimated for the 2015 Report.
- The likelihood of existing-condition SWP Article 21 deliveries (supplemental deliveries to Table A water) being greater than 20 taf/year has decreased by 2% relative to the likelihood presented in the 2015 Report.

Section 1

Reasons to Assess SWP Water Delivery Capability

Two major factors underscore the importance of assessing the SWP's water delivery capability: the effects of population growth on California's balance of water supply and demand, and State legislations intended to help maintain a reliable water supply.

Population Growth, Land Use, and Water Supply

California's population has grown rapidly in recent years, with resulting changes in land use. This growth is expected to continue. From 1990 to 2005, California's population increased from about 29.8 million to about 36 million. Based on this trend, California's population has been projected to be more than 40.8 million by 2020. The "current trends" scenario depicted in the *California Water Plan 2013* for year-2050 conditions, based on the California Department of Finance's projections of 2010 U.S. Census data, assumes a population of nearly 51 million—a 75% increase in the 1990 population.

The amount of water available in California can vary greatly from year to year. Some areas may receive 2 inches of rain a year, while others are deluged with 100 inches or more. As land uses have changed, population centers have emerged in many locations without sufficient local water supplies. Thus, Californians have always been faced with the problem of how best to conserve, control, and move water from areas of abundant water to areas of water need and use.

Legislation on Ensuring a Reliable Water Supply

The laws described below impose specific requirements on both urban and agricultural water suppliers. These laws increase the importance of SWP water delivery capability estimates to local and regional water purveyors.

Urban Water Management Planning Act

The Urban Water Management Planning Act was enacted in 1983 (California Water Code, Sections 10610–10656). As amended, this law requires all public urban water purveyors to adopt urban water management plans (UWMPs) every 5 years and submit those plans to DWR. DWR reviews submitted plans to report to the legislature on the status of submitted plans and for the purposes of grant eligibility requirements.

UWMPs must include an estimate of water supply and demand for a 20-year planning horizon and three water-year types, normal, single dry year and multi dry years. SWP Contractors use SWP delivery capability to estimate their long-term water supply needs from other sources available to them.

DWR publishes a guidebook to assist water suppliers prepare their urban water management plans. Guidance documents are available at <http://www.water.ca.gov/urbanwatermanagement>.

The municipalities and water districts that have adopted 2010 UWMPs and submitted them to DWR are listed at https://wuedata.water.ca.gov/uwmp_plans.asp.

Water Conservation Act

The Water Conservation Act of 2009 (Senate Bill X7.7, Steinberg), enacted in November 2009, includes requirements for urban and agricultural suppliers. Water suppliers report on compliance with these requirements in either the urban or agricultural water management plans. DWR reviews plans for consistency with Water Conservation Act requirements.

This law sets goals for the State of California to reduce average statewide per capita urban water use by 10% by the end of 2015, and 20% by the end of 2020. Urban (M&I) water suppliers in their 2010 UWMPs, calculated baseline water-use and set targets for 2015 and 2020. Data submitted by participating local/regional suppliers on water use reduction target compliance, show a cumulative reduction in statewide M&I water production of more than 22% during the 22-month period of June 2015 through March 2017. DWR is required to report to the Legislature on progress toward meeting the State's goal of 20% reduction by 2020.

In addition, as part of the Water Conservation Act, agricultural water suppliers with 25,000 acres or more of irrigated land were required to prepare and adopt agricultural water management plans and submit the plans to DWR by the end of 2012 and then once every five years beginning in 2015. The Act also required suppliers to measure volumetrically water deliveries to farms and base the price of water sales at least in part on the volume of water delivered. Water suppliers were required to report on water measurement and water pricing in the water management plans.

In June 2015, DWR released a guidebook for developing agricultural water management plans:

<http://www.water.ca.gov/wateruseefficiency/sb7/docs/2015/Approved%20Final%202015%20AWMP%20Guidebook%20June%202015.pdf>

Water agencies filing agricultural water management plans are listed on a Web page maintained by DWR's Water Use and Efficiency Branch:

http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/032315_2012_AWMPs_Received_12March2015.pdf

Section 2

Regulatory Restrictions on SWP Delta Exports

Multiple needs converge in the Delta: the need to protect a fragile ecosystem, to support Delta recreation and farming, and to provide water for agricultural and urban needs throughout much of California. Various regulatory requirements are placed on the SWP's Delta operations to protect special-status species such as delta smelt and spring- and winter-run Chinook salmon. As a result, as described below, restrictions on SWP operations imposed by State and federal fish and wildlife agencies contribute substantially to the challenge of accurately determining the SWP's water delivery reliability in any given year.

Biological Opinions on Effects of Coordinated SWP and CVP Operations

Several fish species listed under the federal Endangered Species Act (ESA) as threatened or endangered are found in the Delta. These protected species' health and the viability of their populations are impacted by various factors, including SWP and CVP operations, nonnative species, predation, Delta salinity, water quality and contaminants, sediment supply, physical alterations to the Delta, land subsidence, pelagic organism decline, methylmercury and selenium, invasive aquatic vegetation, low dissolved oxygen (DO) levels and illegal harvest.

Because of the decline of these species, the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have issued several Biological Opinions (BiOps) since the 1990s on the effects of coordinated SWP/CVP operations on several listed species. (USFWS Biological Opinion for Delta smelt protection and NMFS Biological Opinion for salmonids, green sturgeon, and Southern Resident killer whales.)

These BiOps affect the SWP's water delivery reliability for two reasons. Most notably, they include terms that restrict SWP exports in the Delta to specific amounts at certain times under certain conditions. In addition, the BiOps' requirements are predicated on physical and biological conditions that occur daily while DWR's water supply models are based on monthly data.

The first BiOp on the effects of SWP (and CVP) operations were issued in February 1993 (NMFS BiOp on effects of project operations on winter-run Chinook salmon) and March 1995 (USFWS BiOp on project effects on delta smelt and splittail). Among other things, the BiOps contained requirements for Delta inflow, Delta outflow, and export pumping restrictions in order to protect listed species. These requirements imposed substantial constraints on Delta water supply operations. Many were incorporated into the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta*² (1995 WQCP), as described in the “Water Quality Objectives” section, below.

² The SWRCB is currently updating the WQCP

The terms of the USFWS and NMFS BiOps have become increasingly restrictive over the years. In 2004 the USBR sought a new BiOp from USFWS regarding the operation of the Central Valley Project (CVP) and the State Water Project (SWP) (collectively, Projects). USFWS issued the opinion in 2005, finding that the proposed coordinated operations of the Projects were not likely to jeopardize the continued existence of the delta smelt or result in the destruction or adverse modification of its critical habitat. After judicial review, the 2005 BiOp was vacated and USFWS was ordered to prepare a new one. USFWS found that the proposed operations of the Project would result in jeopardy to the delta smelt and in December 2008 issued a Jeopardy BiOp which included a Reasonable and Prudent Alternative (RPA) with more protective export restrictions and other actions intended to protect the delta smelt.

Similarly, in 2004 NMFS issued a BiOp on the effects of the coordinated operation of the Projects on salmonids, green sturgeon, and Southern Resident killer whales and found that the proposed operations of the Projects were not likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of their critical habitat. After judicial review, the 2004 BiOp was also vacated and NMFS was ordered to prepare a new one. In June 2009, NMFS issued a Jeopardy BiOp covering effects on winter-run and spring-run Chinook salmon, steelhead, green sturgeon, and killer whales. Like the 2008 smelt BiOp, the salmon BiOp included an RPA with more protective export restrictions and other actions intended to protect listed species.

The USFWS BiOp includes requirements on operations in all but 2 months of the year. The BiOp calls for “adaptively managed” (adjusted as necessary based on the results of monitoring) flow restrictions in the Delta intended to protect delta smelt at various life stages. USFWS determines the required target flow with the reductions accomplished primarily by reducing SWP and CVP exports. Because this flow restriction is determined based on fish location and decisions by USFWS staff, predicting the flow restriction and corresponding effects on export pumping with any great certainty poses a challenge. The USFWS BiOp also includes an additional salinity requirement in the Delta for September and October in wet and above-normal water years, calling for increased releases from SWP and CVP reservoirs to reduce salinity. Among other provisions included in the NMFS BiOp, limits on total Delta exports have been established for the months of April and May. These limits are mandated for all but extremely wet years.

The 2008 and 2009 BiOps were issued shortly before and shortly after the Governor proclaimed a statewide water shortage state of emergency in February 2009, amid the threat of a third consecutive dry year. NMFS calculated that implementing its BiOp would reduce SWP and CVP Delta exports by a combined 5% to 7%, but DWR’s initial estimates showed an impact on exports closer to 10% in average years, combined with the effects of pumping restrictions imposed by the BiOps to protect delta smelt and other species. The operational rules specified in the 2008 and 2009 BiOps continue to be legally required and are the rules used in the analyses presented in this report. It should be noted that in late 2016 USBR and DWR requested reinitiating consultation with NMFS and USFWS on the Coordinated Long-term Operations of the CVP and SWP due to new information and science on declining listed fish species populations. During this reinitiated consultation, the CVP and SWP will continue to operate pursuant to the existing USFWS (2008) and NMFS (2009) Biological Opinion requirements. The

consultation process formally began in 2017 with a kick-off meeting and regular meetings with DWR, regulatory agencies, and stakeholders. A project management plan was developed and scoping notices are anticipated in 2018.

In 2008-2009 and periodically through the drought and for changed circumstances in 2017, CDFW issued consistency determinations under Section 2080.1 of the California Fish and Game Code. The consistency determinations stated that the USFWS and the NMFS BiOps would be consistent with the California Endangered Species Act (CESA). Thus, CDFW allowed incidental take of species listed under both the federal ESA and CESA to occur during SWP and CVP operations without requiring DWR or the USBR to obtain a separate State-issued permit.³

These BiOps affect the SWP's water delivery capability by requiring constraints on the total SWP and CVP exports from the Delta. These constraints include terms that restrict total Delta exports to specific amounts at certain times under certain conditions. A complicating factor in the methodology used in this report, however, is that the BiOps' requirements are predicated on physical and biological conditions that occur daily in the Delta, while DWR's water supply models are based on monthly average data. This requires the application of the artificial neural network (ANN) methodology to long-term planning studies. The DWR ANN constructs a response function for the monthly average water supply regime that is most likely to minimize instances of violation of the conditions of the BiOps and other regulatory constraints for exports from the Delta. The DWR ANN is trained on the average daily results of several 16-year simulations by DWR's Delta Simulation Model 2 (DSM2) that simulates the hydrodynamic conditions in the Delta channels at a 15-minute time resolution.

Delta Inflows

Delta inflows vary considerably from season to season, and from year to year. For example, in an above-normal year, nearly 85% of the total Delta inflow comes from the Sacramento River, more than 10% comes from the San Joaquin River, and the rest comes from the three eastside streams (the Mokelumne, Cosumnes, and Calaveras Rivers).

The type of water year is also an important factor affecting the volume of Delta inflows. When hydrology is analyzed, water years are designated by DWR as "wet" (W), "above normal" (AN), "below normal" (BN), "dry" (D), or "critical" (C). All other factors (such as upstream level of development) being equal, much less water will flow into the Delta during a dry or critical water year (that is, during a drought) than during a wet or above-normal water year. Fluctuations in inflows are a substantial overall concern for the Delta, and a specific concern for the SWP; such fluctuations affect Delta water quality and fish habitat, which in turn trigger regulatory requirements that constrain SWP Delta pumping.

³ However, CDFW stated in an October 2017 response letter to DWR that according to the evidence, the USFWS memorandum (2017 Memorandum), authorizing a change to the required location of X2 in September and October of Wet Years, would not be consistent with the California Endangered Species Act (CESA) requirements

Delta inflows will also vary by time of year as the amount of precipitation varies by season. About 80% of annual precipitation occurs between November and March, and very little rain typically falls from June through September. Upstream reservoirs regulate this variability by reducing flood flows during the rainy season, and storing water to be released later in the year to meet regulatory requirements and water demands.

Water Quality Objectives

Because the Delta is an estuary, salinity is a particular concern. In the 1995 WQCP, the State Water Board set water quality objectives to protect beneficial uses of water in the Delta and Suisun Bay. The objectives must be met by the SWP and federal CVP as specified in the water right permits issued to DWR and the USBR. Those objectives—minimum Delta outflows, limits on SWP and CVP Delta exports, and maximum allowable salinity levels—are enforced through the provisions of the State Water Board's Water Right Decision 1641 (D-1641), issued in December 1999 and updated in March 2000, which implemented the 1995 WQCP.

DWR and the USBR must monitor the effects of diversions and SWP and CVP operations to ensure compliance with existing water quality standards.

Among the objectives established in the 1995 WQCP and D-1641 are the “X2” objectives. X2 is defined as the distance in kilometers from Golden Gate, where salinity concentration in the Delta is 2 parts per thousand. The location of X2 is used as a surrogate measure of Delta ecosystem health.

For the X2 objective to be achieved, the X2 position must remain downstream of Collinsville in the Delta for the entire 5-month period, and downstream of other specific locations in the Delta on a certain number of days each month from February through June. This means that Delta outflow, which among other factors controls the location of X2 must be at certain specified levels at certain times. This can limit the amount of water the SWP may pump at those times at its Harvey O. Banks Pumping Plant in the Delta.

Because of the relationship between seawater intrusion and interior Delta water quality, meeting the X2 objective can also improve water quality at Delta drinking water intakes; however, meeting the X2 objectives can require a relatively large volume of water for outflow during dry months that follow months with large storms.

The 1995 WQCP and D-1641 also established an export/inflow (E/I) ratio. The E/I ratio is designed to provide protection for the fish and wildlife beneficial uses in the Bay Delta estuary. The E/I ratio limits the fraction of Delta inflows that are exported. When other restrictions are not controlling, Delta exports are limited to 35% of total Delta inflow from February through June and 65% of inflow from July through January.

The State Water Board is updating the WQCP. Phase 1 of the WQCP update focuses on flows on the San Joaquin River and salinity objectives in the South Delta. Phase 2 focuses on new inflow requirements for the Sacramento River, its tributaries, and eastside tributaries to the Delta (the Mokelumne, Calaveras and Cosumnes rivers); new and modified Delta outflow requirements; new requirements for cold water habitat; new and modified interior Delta flow requirements; recommendations for

complementary ecosystem protection actions that others should take; and adaptive management, monitoring, evaluation, special study, and reporting provisions. A primary focus of the WQCP update is on additional flows for the beneficial use of fish and wildlife. Based on the environmental documentation that has been produced up to this date by the State Water Board, it is likely that the implementation of these flow requirements will affect SWP contractor deliveries. The State Water Board issued its Substitute Environmental Document (SED), which is the equivalent of CEQA analysis, on Phase 1 in 2016 and expects to issue its SED on Phase 2 in 2018. After these documents are finalized, the proposed changes will have to be adopted through an order of the State Water Board.

Section 3

Ongoing Environmental and Policy Planning Efforts

It is hard to overstate the Delta's importance to California's economy and natural heritage. The Delta supplies a large share of the water used in the state. California would not be the same without that water — hundreds of billions of dollars of economic activity depend upon it. Southern California, with half of the state's population, gets almost a quarter of its average water supply from the Delta; Kern County, which produces nearly \$3 billion annually in grapes, almonds, pistachios, milk, citrus, and carrots, depends on the Delta for about a fifth of its irrigation supply; the west side of the San Joaquin Valley also produces billions of dollars' worth of food and depends on the Delta for about three-quarters of its irrigation supply; and the San Francisco Bay Area, including the innovation hub of Silicon Valley, takes about half of its water supply from the Delta and its tributaries.

At the same time, the hundreds of miles of river channels that crisscross the Delta's farmed islands provide a migratory pathway for Chinook salmon, which support an important West Coast fishing industry. Other native fish species depend upon the complex mix of fresh and salt water in the Delta estuary. Multiple stressors have impaired the ecological functions of the Delta, and concerns have been growing over the ability to balance the many needs of both people and the ecosystem.

In order to respond to these concerns, considerable effort by government agencies and California water community as a whole has been spent during the past several decades to study ways that the problems in the Delta can be addressed, and the more recent attention to the effects of climate change has helped the water community to realize the urgency of addressing these problems. The essential part of all these efforts has been to find a comprehensive solution that brings various, sometimes competing, interests together in a coordinated and concerted set of actions. The Delta Plan and the Bay Delta Conservation Plan (BDCP)/California WaterFix are two large-scale planning efforts that are in development. Once implemented, both efforts, could affect SWP water delivery capability in different ways, and at different scales.

Delta Plan

After years of concern about the Delta amid rising water demand and habitat degradation, the Delta Stewardship Council was created in legislation to achieve State-mandated coequal goals for the Delta. As specified in Section 85054 of the California Water Code:

“Coequal goals” means the two goals of providing more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

The final Delta Plan was adopted by the Council on May 16, 2013. The Delta Plan contains a set of 14 regulatory policies as well as 73 recommendations, which are non-regulatory but identify actions essential to achieving the coequal goals. The State

Office of Administrative Law (OAL) approved the 14 regulations to implement the Delta Plan, which became effective with legally-enforceable regulations on September 1, 2013.

The Council is required to review the Delta Plan at least every five years. To be responsive to changing circumstances and in accordance with commitments made in the 2013 Plan, the Council amended the Delta Plan twice in 2016, and work on several other amendments are underway.

The Delta Plan as adopted in 2013 called for completion of the Bay Delta Conservation Plan (BDCP). Pursuant to the Delta Reform Act of 2009, the BDCP, if it met all other requirements of law, was to be automatically incorporated into the Delta Plan. The Delta Plan also provided that if the BDCP were not approved by Jan. 1, 2016, the Council would consider amending the Delta Plan to promote options for new conveyance and storage projects and how they could be operated.

To fulfill the Delta Plan's directives, the Council this year directed staff to develop a proposed amendment to the Delta Plan regarding Delta conveyance, water storage, and the operation of both.

Bay Delta Conservation Plan (BDCP)/California WaterFix

In 2006, state and federal agencies started pursuing an ambitious and comprehensive conservation plan under Section 10 of the Endangered Species Act (ESA) and California's Natural Community Conservation Planning Act. The approach included new water conveyance facilities and sought to improve reliability of water delivery and contribute to the recovery of listed species under a single regulatory package. A draft Bay Delta Conservation Plan (BDCP) and draft EIR/EIS were released for a public comment period that began in December 2013 and closed in July 2014. While the draft EIR/EIS was out for public review several significant changes were announced by the Brown Administration and its federal partners.

Based on these project changes and in consideration of comments received on the draft EIR/EIS, state and federal agencies announced in April 2015 a change in their approach to seeking a permit for a project to improve, protect, and maintain ecosystem health, water quality, and water supplies so that the SWP and CVP are capable of reliably delivering water within a stable regulatory framework. Rather than pursue the project as a Habitat Conservation Plan (HCP), under Section 10 of the ESA, and a Natural Community Conservation Plan (NCCP), under the state's Natural Community Conservation Planning Act, the state and federal agencies chose to study additional alternatives to achieve the dual goals through implementation of new water conveyance facilities that would be built in compliance with Section 7 of the ESA and Section 2081(b) of the California ESA.

Based on this change in the permitting approach and other design modifications, DWR and the USBR released a joint Partially Recirculated Draft EIR/Supplemental Draft EIS on the Bay Delta Conservation Plan/California WaterFix for public review and comment from July 2015 through October 2015. The draft document included analysis of three new sub-alternatives as well as additional analysis and refinement of portions of the previous draft environmental document. The additional sub-alternatives do not include an HCP/NCCP, as was proposed as part of the alternatives analyzed in the

previously circulated documents. Instead, the alternative implementation strategy allows for other state and federal programs to address the long-term conservation efforts for species recovery in programs separate from the project.

The new sub-alternatives, including the new preferred alternative known as California WaterFix (sub-alternative 4A), focus on the conveyance facility improvements necessary for the SWP and CVP to address more immediate water supply reliability needs in conjunction with ecosystem improvements to significantly reduce reverse flows and fish species impacts associated with the existing south Delta intakes.

In December of 2016, DWR and the USBR publicly released a Final EIR/EIS. The Final EIR/EIS describes the alternatives, discusses potential environmental impacts, and identifies mitigation measures that would help avoid or minimize impacts. It also provides responses to all substantive comments received on the 2013 Draft Environmental Impact Report/Environmental Impact Statement and 2015 Partially Recirculated Draft Environmental Impact Report /Supplemental Draft Environmental Impact Statement. In July 2017, DWR released a Notice of Determination and certified the Final EIR under the California Environmental Quality Act. The USBR has not issued a ROD under the National Environmental Protection Act (NEPA) as of the date of this report.

Biological Opinions for CA WaterFix

Moving forward with the alternative implementation strategy (described above), in January 2016, DWR and the USBR released a draft Biological Assessment, which included a species-by-species analysis and proposed mitigation to offset and avoid potential project impacts. In August 2016, DWR and the USBR submitted a revised Biological Assessment to USFWS and NMFS to initiate formal consultation and under Section 7 of the ESA and begin the process of obtaining incidental take authorization for federally-listed species. Remaining consistent with the change in approach, in October 2016, DWR submitted a 2081 (b) application to CDFW to address incidental take of state-listed species for California ESA compliance. The incidental take analysis included in the 2081(b) application analyzes potential project impacts and provides mitigation necessary to ensure project impacts are fully mitigated. In January 2017, NMFS, USFWS, and CDFW submitted draft CA WaterFix Biological Opinion and 2081(b) mitigation analyses to the Delta Science Program's Aquatic Science Peer Review Panel. During this time, DWR and USBR assisted and coordinated with NMFS, USFW, CDFW working towards the completion of the CA WaterFix Biological Opinions and 2081(b) document. In June 2017, NMFS and USFWS Service released their final Biological Opinions. In July 2017, CDFW issued the incidental take permit (20181(b) document).

EcoRestore

In addition to the new Section 7 permitting approach, and preferred alternative California WaterFix, Governor Brown announced the creation of the California EcoRestore program in April 2015, committing to restore more than 30,000 acres of Delta habitat, which will be implemented on an accelerated timeline independent of the proposed water conveyance facilities. This comprehensive suite of habitat restoration actions under the California EcoRestore program includes specific targets for

floodplain, tidal and sub-tidal, managed wetlands, and fish passage improvements to benefit native fish species and a commitment to adaptive management. A subset of the program's targets includes breaking ground on efforts complying with the restoration required by the 2008 and 2009 Biological Opinions for Long Term Operations of the SWP and CVP.

Section 4

State Water Project Historical Deliveries (2007-2016)

Section 4 and Section 6 present the State Water Project Historical Deliveries from 2007-2016 (Calendar year). Section 4, this section, focuses on the annual minimum, maximum, and average total contractor combined deliveries during this 10 year (2007-2016) period. Section 6 of this report includes tables listing annual historical deliveries by various water classifications for each SWP Contractor for 2007–2016.

Contractor deliveries are presented as four different delivery types - Table A delivery, an Article 21 delivery, a carryover delivery, or a turnback delivery. These delivery types are briefly described below.

“Table A” Water is an exhibit to the SWP’s water supply contracts. The maximum Table A amount is the basis for apportioning water supply and costs to the SWP contractors. Once the total amount of water to be delivered is determined for the year, all available water is allocated in proportion to each contractor’s annual maximum SWP Table A amount.

Article 21 Water (it is described in Article 21 of the water contracts) is water that SWP contractors may receive on a short-term basis in addition to their Table A water, if they request it. Article 21 water is used by many SWP contractors to help meet demands when allocations are less than 100%. The availability and delivery of Article 21 water cannot interfere with normal SWP operations.

Carryover Water is SWP water that is allocated to an SWP contractor and approved for delivery to that contractor in a given year, but not used by the end of the year. This water is exported from the Delta by the Banks Pumping Plant, but instead of being delivered to the contractor, it is stored in the SWP’s share of San Luis Reservoir, when space is available, for the contractor to use in the following year.

Turnback Pool Water SWP contractors may offer a portion of their Table A water that has been allocated in the current year and exceeds their needs to a “turnback pool,” where another contractor may purchase it. Contractors that sell their extra Table A water in a turnback pool receive payments from contractors that buy this water.

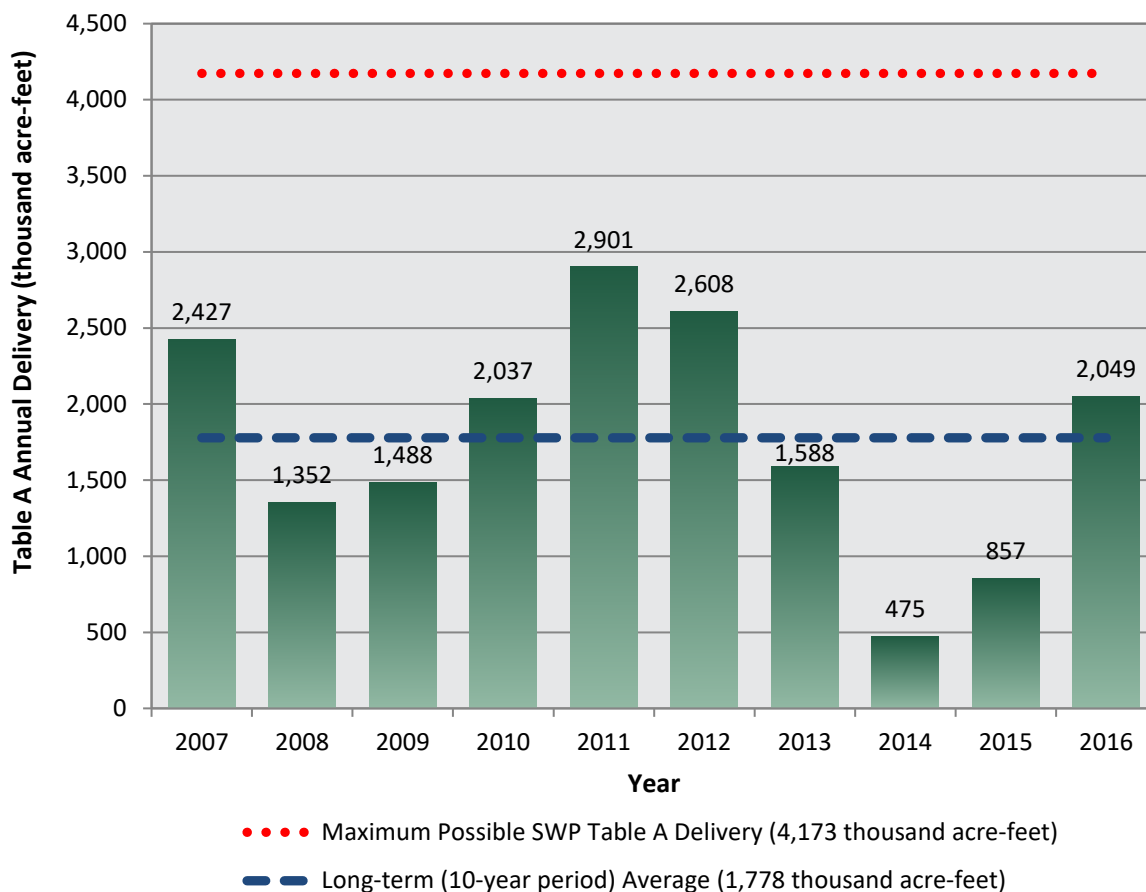
Table 4-1 lists the maximum annual SWP Table A water delivery amounts for SWP Contractors. Figure 4-1 shows that deliveries of SWP Table A water for 2007–2016 range from an annual minimum of 475 taf to a maximum of 2,901 taf, with an average of 1,778 taf. Historical deliveries of SWP Table A water over this 10-year period are less than the maximum of 4,173 taf/year.

Total historical SWP deliveries, including Table A, Article 21, turnback pool, and carryover water, range from 3,353 to 477 taf/ year, with an average of 1,872 taf/year for the period of 2007–2016 (Figure 4-2).

Table 4-1. Maximum Annual SWP Table A Water Delivery Amounts for SWP Contractors

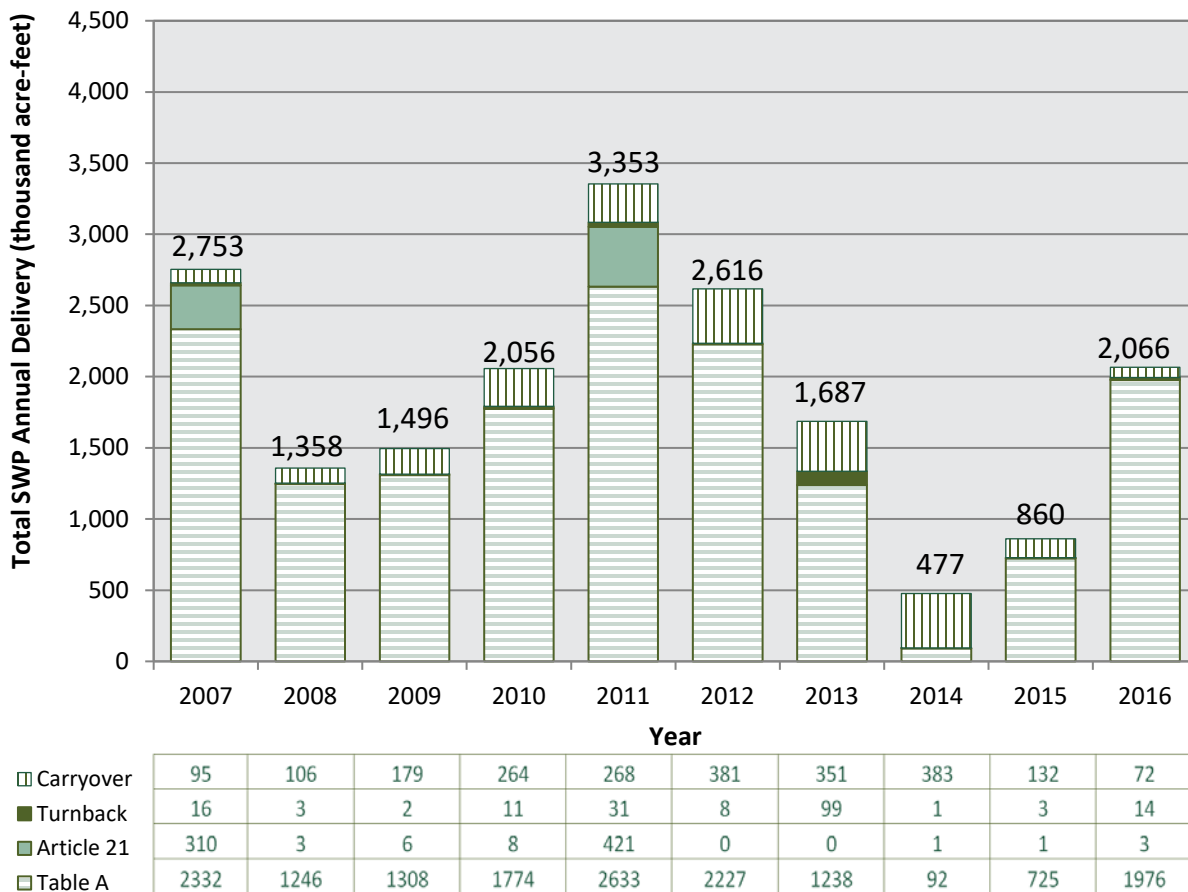
Contractor	Maximum Table A Delivery Amounts (acre-feet)
Feather River Area Contractors	
Butte County	27,500
Yuba City	9,600
Plumas County Flood Control and Water Conservation District	2,700
Subtotal	39,800
North Bay Area Contractors	
Napa County Flood Control and Water Conservation District	29,025
Solano County Water Agency	47,756
Subtotal	76,781
South Bay Area Contractors	
Alameda County Flood Control and Water Conservation District, Zone 7	80,619
Alameda County Water District	42,000
Santa Clara Valley Water District	100,000
Subtotal	222,619
San Joaquin Valley Area Contractors	
Dudley Ridge Water District	45,350
Empire West Side Irrigation District	3,000
Kern County Water Agency	982,730
Kings County	9,305
Oak Flat Water District	5,700
Tulare Lake Basin Water Storage District	87,471
Subtotal	1,133,556
Central Coastal Area Contractors	
San Luis Obispo County Flood Control and Water Conservation District	25,000
Santa Barbara County Flood Control and Water Conservation District	45,486
Subtotal	70,486
Southern California Area Contractors	
Antelope Valley–East Kern Water Agency	144,844
Castaic Lake Water Agency	95,200
Coachella Valley Water District	138,350
Crestline–Lake Arrowhead Water Agency	5,800
Desert Water Agency	55,750
Little Rock Creek Irrigation District	2,300
Metropolitan Water District of Southern California	1,911,500
Mojave Water Agency	85,800
Palmdale Water District	21,300
San Bernardino Valley Municipal Water District	102,600
San Gabriel Valley Municipal Water District	28,800
San Geronio Pass Water Agency	17,300
Ventura County Watershed Protection District	20,000
Subtotal	2,629,544
TOTAL TABLE A AMOUNTS	4,172,786

Source: California State Water Project Bulletin 132.



Note: The differences in historical deliveries from those reported in the DCR 2015 are due to the State Water Project Analysis Office (SWPAO) reclassification of the various components of water delivered to the SWP Contractors.

Figure 4-1. Historical Deliveries of SWP Table A Water, 2007–2016



Note: The differences in historical deliveries from the State Water Project Delivery Capability Report 2015 are due to reclassification of the various components of water delivered to SWP Contractors

Figure 4-2. Total Historical SWP Deliveries, 2007–2016 (by Delivery Type)

Section 5

Existing SWP Water Delivery Capability (2017)

This Section presents estimates of the SWP's existing (2017) water delivery capability (Water Year). The estimates are presented below, alongside the results obtained from the 2015 Report. Like this 2017 Report, the 2015 Report incorporated the requirements of BiOps issued by USFWS and NMFS in December 2008 and June 2009, respectively, on the effects of coordinated operations of the SWP and CVP. These BiOps are discussed in detail in Section 2, "Regulatory Restrictions on SWP Delta Exports."

The discussions of SWP water delivery capability in this Section presents the results of DWR's updated modeling of the SWP's water delivery capability. A tabular summary of the modeling results is presented in the Technical Addendum of this report, which is available online at <http://baydeltaoffice.water.ca.gov/>. The Technical Addendum also contains annual delivery probability curves (i.e., exceedance plots) to graphically show the estimated percentage of years in which a given annual delivery is equaled or exceeded.

Hydrologic Sequence

SWP delivery amounts are estimated in this 2017 Report for existing conditions using computer modeling³ that incorporates the historic range of hydrologic conditions (i.e., precipitation and runoff) that occurred from water years 1922 through 2003. The historic hydrologic conditions are adjusted to account for land-use changes (i.e., the current level of development) and upstream flow regulations that characterize 2017, and current sea levels reflecting sea level rise. By using this 82-year historical flow record, the delivery estimates modeled for existing conditions reflect a reasonable range of potential hydrologic conditions from wet years to critically dry years.

Water Year Type Definition

The Sacramento valley 40-30-30 index is used to define the water year type. The Sacramento valley index, previously referred to as the "4 River Index" or "4 Basin Index," is the sum of the unimpaired runoff of four rivers: the Sacramento River above Bend Bridge near Red Bluff, Feather River inflow to Lake Oroville Reservoir, Yuba River at Smartville, and American River inflow to Folsom Lake. The five water year types used in the Sacramento River Index are as follows:

³ CalSim II was used to perform the modeling simulations.
<http://baydeltaoffice.water.ca.gov/modeling/hydrology/WRIMS2/index.cfm>

Table 5-1. Water year types used in the Sacramento River Index

Sacramento River Index	Water Year Type
1	Wet
2	Above Normal
3	Below Normal
4	Dry
5	Critical

Existing Demand for Delta Water

Demand levels for the SWP water users in this report are derived from historical data and information from the SWP Contractors themselves. The amount of water that the SWP contractors request each year is related to:

- The magnitude (maximum contracted amount),
- The extent of water conservation measures, in place,
- Local weather patterns, and
- Water costs.

The existing level of development (i.e., the level of water use in the source areas from which the water supply originates) is based on recent land uses, and is assumed to be representative of existing conditions for the purposes of this 2017 Report.

SWP Table A Water Demands

The current combined maximum Table A amount is 4,173 taf/year. See Table 4-1 in Section 4, "State Water Project Historical Delivery Capability (2007-2016). Of the combined maximum Table A amount, 4,133 taf/year is the SWP's maximum Table A water available for delivery from the Delta.

The estimated demands by SWP Contractors for deliveries of Table A water from the Delta under existing conditions is assumed to be the maximum SWP Table A delivery amount for the 2017 Report (Table 5-2). Estimated demands for SWP Table A water is 1 taf/year higher than the 2015 Report since the maximum Table A demand amount for some SWP Contractors has changed in Table 4-1 according to the California State Water Project Bulletin 132. Due to the fact that SWP Contractors have been requesting the full amount in recent years, the 2015, and the 2017 Reports more accurately reflect the trend in demand.

Table 5-2. Comparison of Estimated Average, Maximum, and Minimum Demands for SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year)

	2015 Report	2017 Report
Average	4,132	4,133
Maximum	4,132	4,133
Minimum	4,132	4,133

SWP Article 21 Water Demands

Under Article 21 of the SWP's long-term water supply contracts, Contractors may receive additional water deliveries only under the following specific conditions:

- Such deliveries do not interfere with SWP Table A allocations and SWP operations;
- Excess water is available in the Delta;
- Capacity is not being used for SWP purposes or scheduled SWP deliveries; and
- Contractors can use the SWP Article 21 water directly or can store it in their own system (i.e., the water cannot be stored in the SWP system).

The demand for SWP Article 21 water by SWP Contractors is assumed to vary depending on the month and weather conditions (i.e., amounts of precipitation and runoff). To illustrate how demand varies and for the purposes of this discussion of SWP Article 21 water demands, a Kern wet year is defined as a year when the annual Kern River flow is projected to be greater than 1,500 taf. There are nine Kern wet years in the simulation period of 1922 – 2003 (1941, 1952, 1969, 1978, 1980, 1983, 1986, 1995, and 1998). Kern River inflows are important because they are a major component of the local water supply for Kern County Water Agency (KCWA), which is the second largest SWP Contractor and possesses significant local groundwater recharge capability. During Kern wet years, KCWA uses more Kern River flows to recharge its groundwater storage and reduce its demand for Article 21 water.

As shown in Figure 5-1, existing demands for SWP Article 21 water estimated for this 2017 update of the DCR are assumed to be high during the spring and late fall in Kern non-wet years (214 taf/month) because most of the irrigation districts in this service area cannot rely as heavily on the Kern River flows to recharge their groundwater basins. Demand for Article 21 water is also high during the winter months of December through March in all year types (202 taf in Kern wet years and 414 taf in Kern non-wet years). Demands are assumed to be very low (2 taf/month) from April through November of Kern wet years (because high Kern River flows provide groundwater recharge water) and from July through October of Kern dry years.

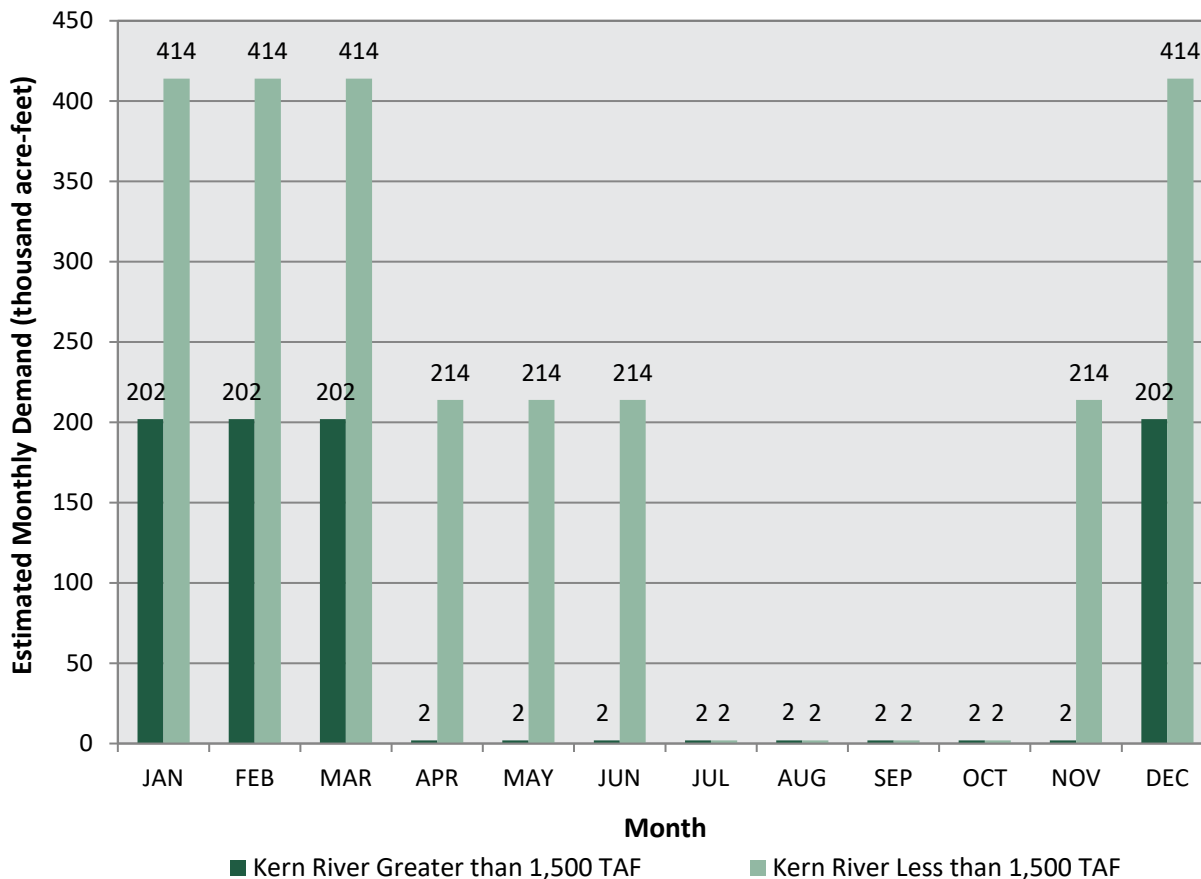
These demand patterns for SWP Article 21 water are identical to what were used in the 2015 update of the DCR, for existing conditions.

Estimates of SWP Table A Water Deliveries

Table 5-3 presents the annual average, maximum, and minimum estimates of SWP Table A deliveries from the Delta for existing conditions, as calculated for the 2015 and 2017 Reports. The average Table A deliveries increased in the 2017 Report mostly due to 30 taf/year demand reduction for the Placer County water agency in the North of Delta. The demand reduction resulted in higher inflow into the Delta, therefore, more water became available for SWP Table A deliveries (Table 5-3).

Table 5-3. Comparison of Estimated Average, Maximum, and Minimum Deliveries of SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year)		
	2015 Report	2017 Report
Average	2,550	2,571
Maximum	4,055	4,098
Minimum	454	336

Assumptions about Table A and Article 21 water demands, along with operations for carryover water, have been updated in the model based on discussions with State Water Contractors staff and DWR's Operations and Control Office.



Note: Values shown are the maximum amount that can be delivered monthly. However, the actual capability of SWP water Contractors to take this amount of SWP Article 21 water is not the sum of these maximum monthly values.

Figure 5-1. SWP Article 21 Demands during Non-Kern Wet Years and Kern Wet Years (Existing Conditions)

Figure 5-2 presents the estimated likelihood of delivery of a given amount of SWP Table A water under the existing conditions scenario, as estimated for both the 2015 and 2017 Reports. This figure shows a 77% likelihood (74% with the 2015 Report) that more than 2,000 taf/year of Table A water will be delivered under the current estimates. The distribution of the delivery ranges has also changed since the 2015 Report. Figure 5-2 shows a shift of Table A deliveries from 500-1,000 taf/year range to 2,000-3000 taf/year range in comparison to the 2015 Report due to the demand decrease in the North of Delta and Water Supply Index – Delivery Index⁴ (WSI-DI) curve in the study.

⁴ WSI-DI relates forecasted water supplies to deliverable “demand,” and then use deliverable “demand” to assign subsequent delivery levels to estimate the water available for delivery and carryover storage.

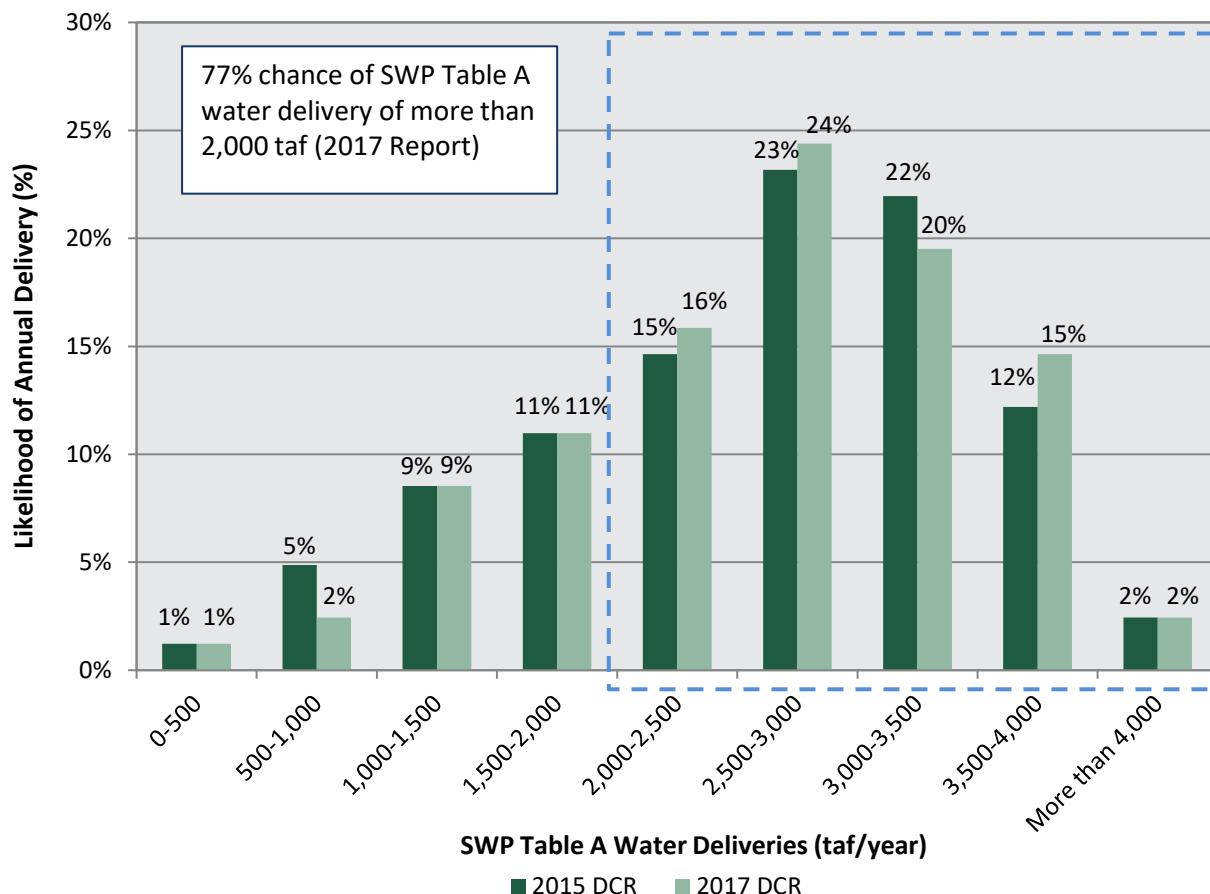


Figure 5-2. Estimated Likelihood of SWP Table A Water Deliveries, by Increments of 500 taf (Excluding Butte County and Yuba City)

Wet-Year Deliveries of SWP Table A Water

Table 5-4 and Figure 5-3 present estimates of SWP Table A water deliveries under existing conditions during possible wet conditions and compares them with corresponding delivery estimates calculated for the 2015 Report. Wet periods for 2017 are analyzed using historical precipitation and runoff patterns from 1922–2003 as a reference, while accounting for existing 2017 conditions (e.g., land use, water infrastructure). For reference, the wettest single year on the 1992-2003 record was 1983.

The results of modeling existing conditions over historical wet years indicate that SWP Table A water deliveries during wet periods can be estimated to range between yearly averages of 4,098 to 3,163 taf.

Table 5-4 shows that the 2017 deliveries of SWP Table A water stayed relatively the same in wet periods in comparison to the 2015 Report.

Table 5-4. Estimated Average and Wet-Period Deliveries of SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year), and Percent of Maximum SWP Table A Amount, 4,133 taf/year

	Long-term Average (1921–2003)		Single Wet Year (1983)		Wet Periods							
					2 Years (1982–1983)		4 Years (1980–1983)		6 Years (1978–1983)		10 Years (1978–1987)	
2015 Report	2,550	62%	4,055	98%	3,946	95%	3,558	86%	3,414	83%	3,123	76%
2017 Report	2,571	62%	4,098	99%	3,967	96%	3,569	86%	3,433	83%	3,163	77%

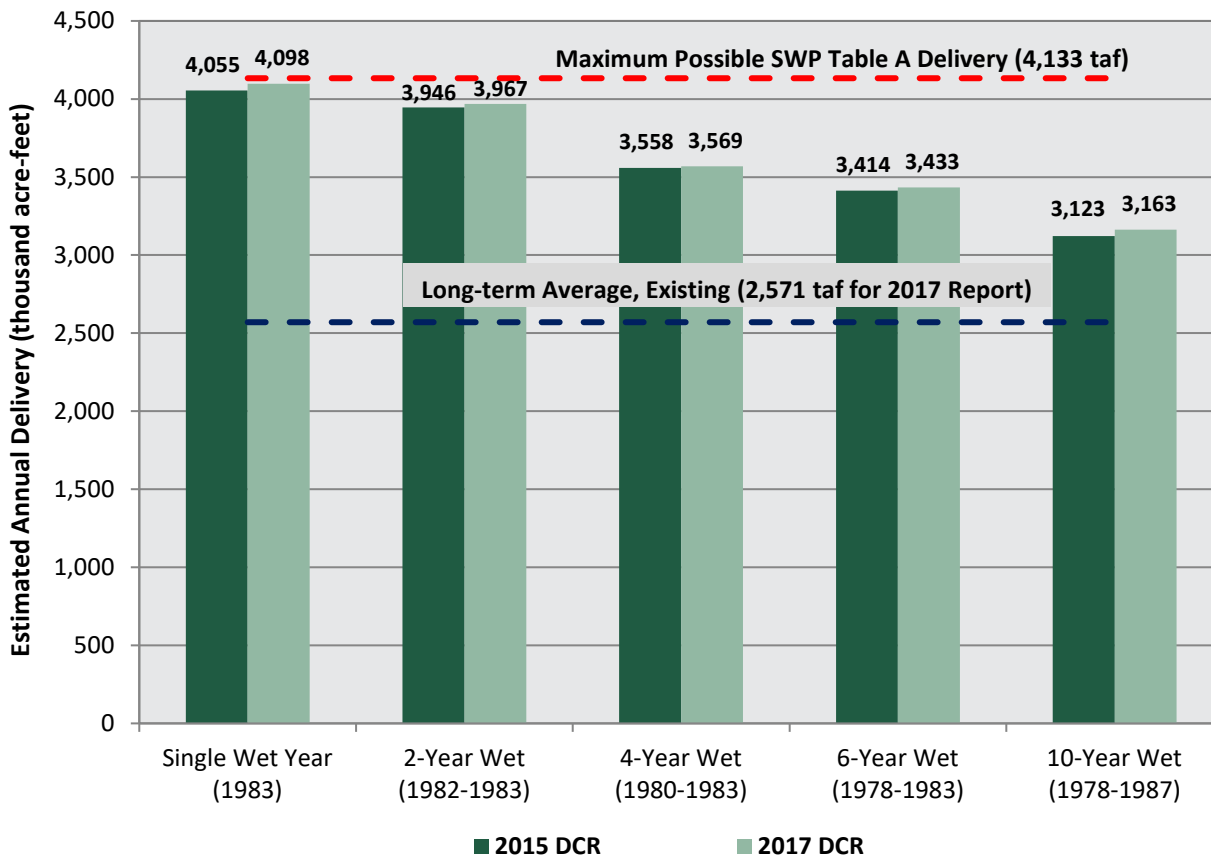


Figure 5-3. Estimated Wet-Period SWP Table A Water Deliveries (Excluding Butte County and Yuba City)

Dry-Year Deliveries of SWP Table A Water

Table 5-5 and Figure 5-4 display estimates of existing-conditions deliveries of SWP Table A water during possible drought conditions and compares them with the corresponding delivery estimates calculated for the 2015 Report. Droughts are analyzed using the historical drought-period precipitation and runoff patterns from 1922 through 2003 as a reference, although existing 2015 conditions (e.g., land use, water infrastructure) are also accounted for in the modeling. For reference, the worst multiyear drought on the 1922–2003 record was the 1929–1934 drought, although the brief drought of 1976–1977 was more intensely dry.

The results of modeling existing conditions under historical drought scenarios indicate

that SWP Table A water deliveries during dry years can be estimated to range between yearly averages of 336 and 1,408 taf.

On average, the dry-period deliveries of Table A water are higher in this 2017 Report than in the 2015 Report due to the demand decrease in the North of Delta and WSI-DI curve in the study. Table 5-5 indicates that the Table A deliveries for the single dry year (1977) has decreased, but the two-year drought (1976-1977) has increased. WSI-DI along with the model allocation logic allowed more water delivery in water year 1976, but less water delivery in water year 1977.

Table 5-5. Estimated Average and Dry-Period Deliveries of SWP Table A Water, Excluding Butte County and Yuba City (Existing Conditions, in taf/year), and Percent of Maximum SWP Table A Amount, 4,133												
	Long-term Average (1921-2003)		Single Dry Year (1977)		Dry Periods							
					2-Year Drought (1976-1977)		4-Year Drought (1931-1934)		6-Year Drought (1987-1992)		6-Year Drought (1929-1934)	
2015 Report	2,550	62%	454	11%	1,165	28%	1,356	33%	1,182	29%	1,349	33%
2017 Report	2,571	62%	336	8%	1,206	29%	1,397	34%	1,203	29%	1,408	34%

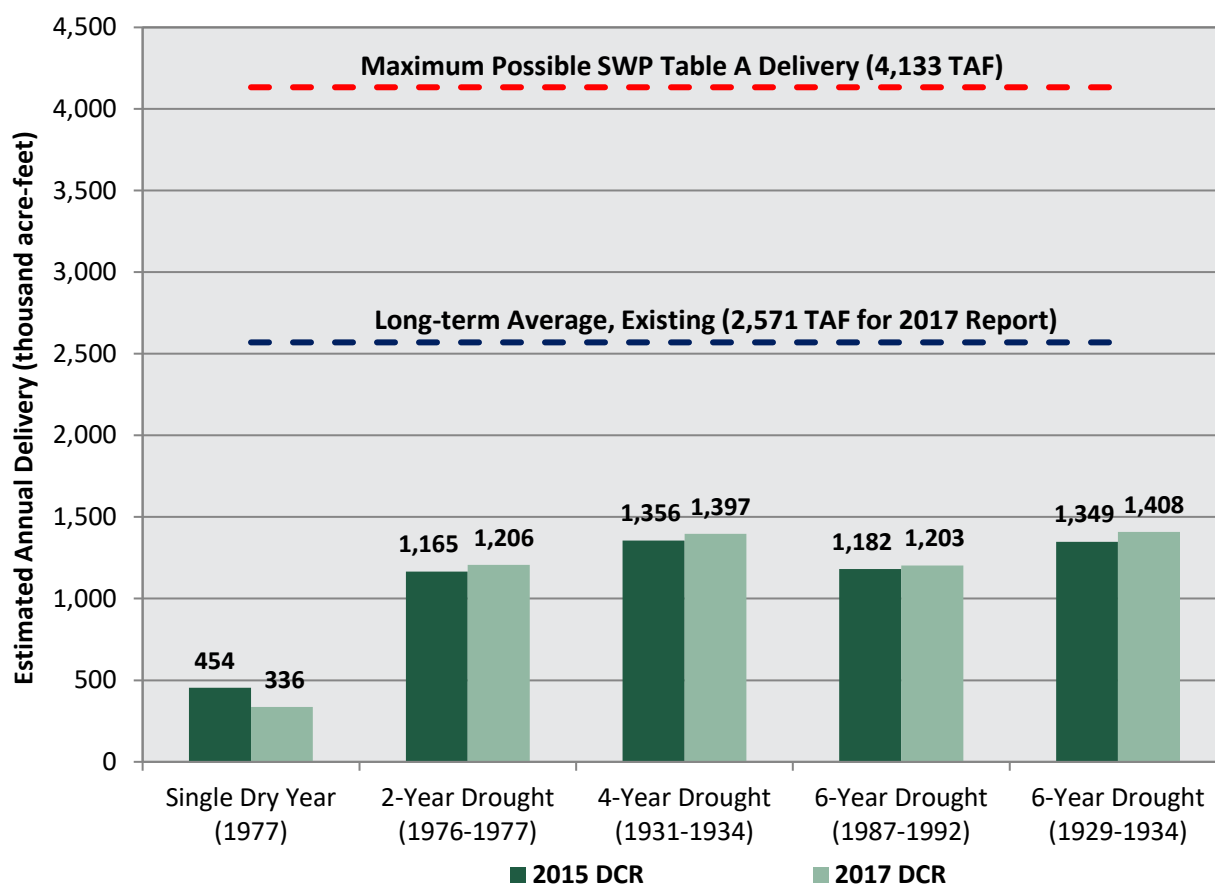


Figure 5-4. Estimated Dry-Period SWP Table A Water Deliveries (Excluding Butte County and Yuba City)

Estimates of SWP Article 21 Water Deliveries

SWP water delivery is a combination of deliveries of Table A water and Article 21 water. Some SWP Contractors store Article 21 water locally when extra water and capacity are available beyond that needed by normal SWP operations. Deliveries of SWP Article 21 water vary not only by year, but also by month. The estimated range of monthly deliveries of SWP Article 21 water is displayed in Figure 5-5. In May through October, essentially no Article 21 water is estimated to be delivered. In the late fall and winter (November through April), maximum monthly deliveries range from 84 to 340 taf/month.

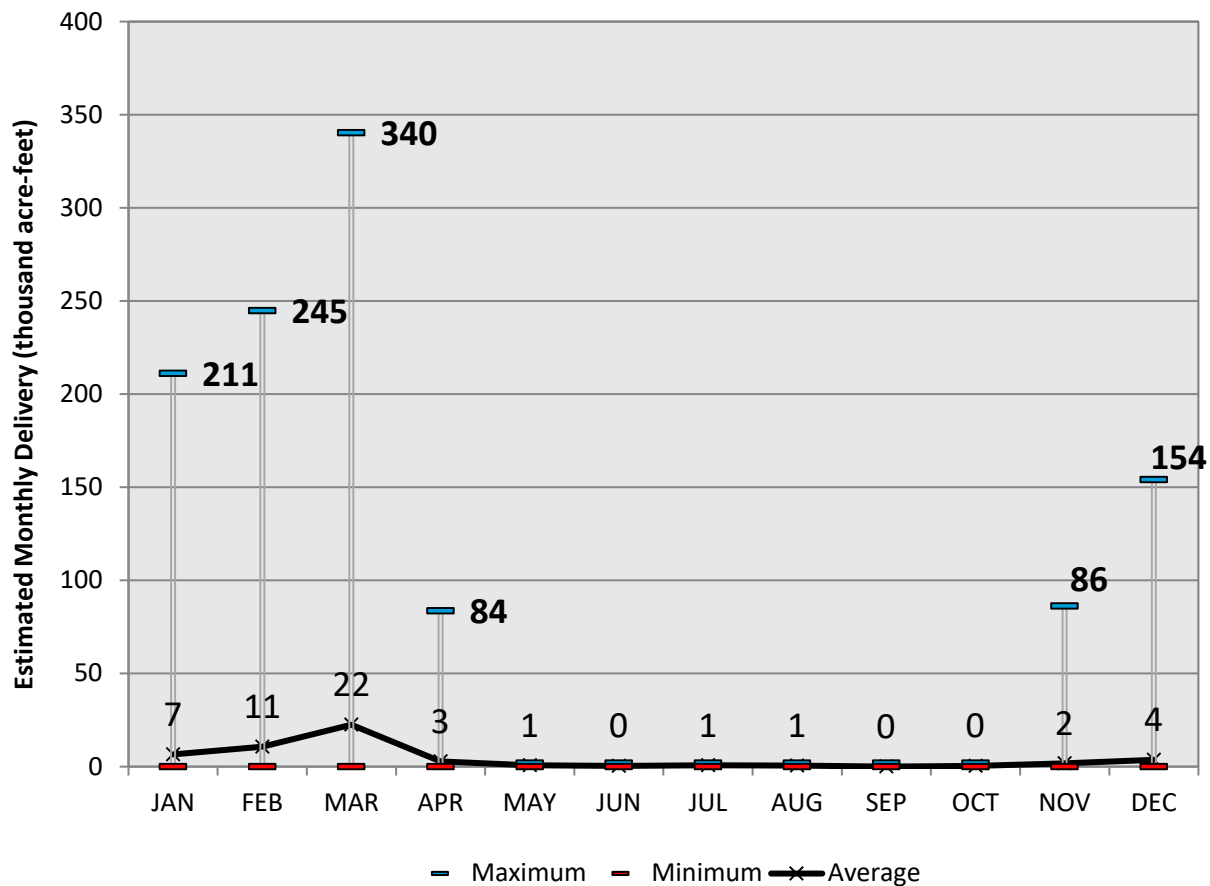


Figure 5-5. Estimated Range of Monthly Deliveries of SWP Article 21 Water (Existing Conditions)

The estimated likelihood that a given amount of SWP Article 21 water will be delivered is presented in Figure 5-6.

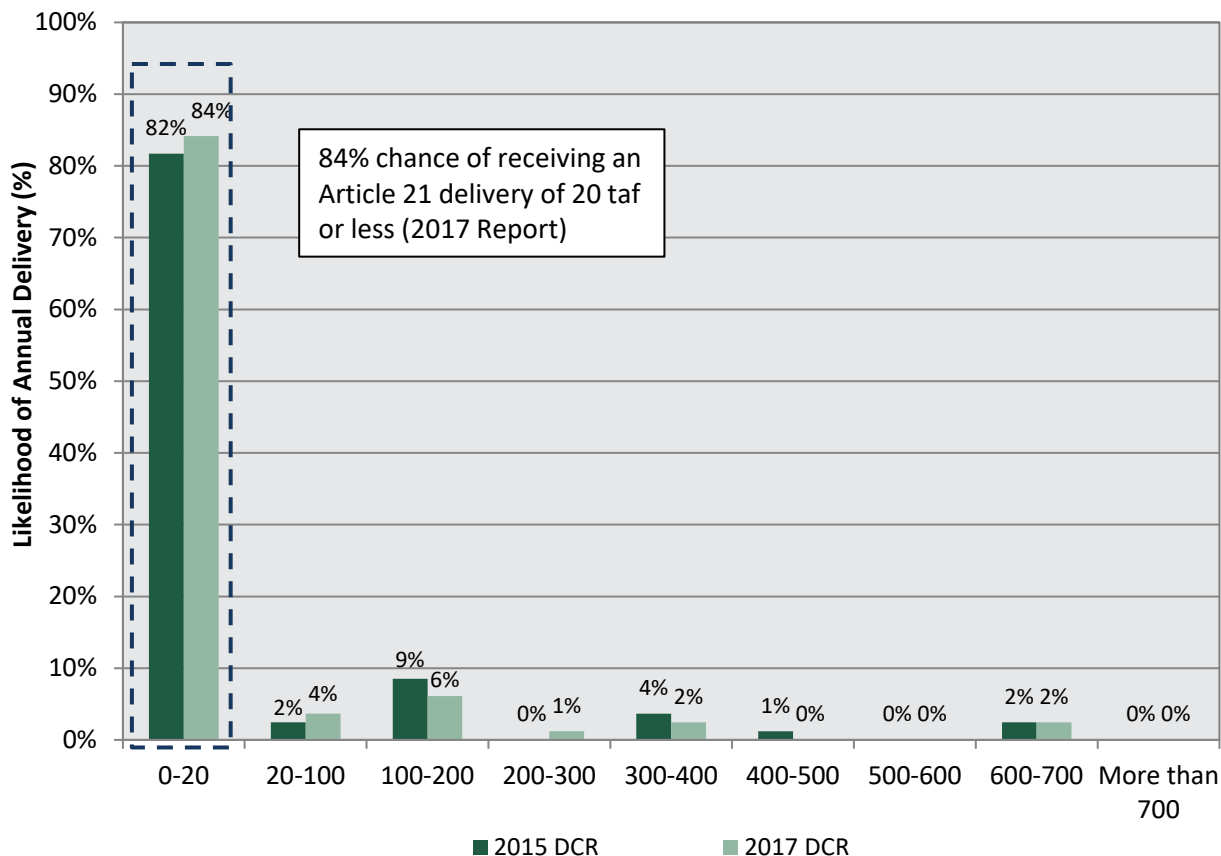


Figure 5-6. Estimated Likelihood of Annual Deliveries of SWP Article 21 Water (Existing Conditions)

Wet-Year Deliveries of SWP Article 21 Water

Table 5-6 shows the estimates of deliveries of SWP Article 21 water during wet periods under existing conditions. Estimated deliveries in wet years are approximately 1.7 to 5.5 times larger than the average existing-conditions delivery of SWP Article 21 water.

In general, the wet-period Article 21 deliveries in this 2017 Report are lower than in the 2015 Report.

	Long-term Average (1921-2003)	Single Wet Year (1983)	Wet Periods			
			2 Years (1982-1983)	4 Years (1980-1983)	6 Years (1978-1983)	10 Years (1978-1987)
2015 Report	56	316	204	134	93	134
2017 Report	50	273	183	123	86	123

Dry-Year Deliveries of SWP Article 21 Water

Although deliveries of SWP Article 21 water are smaller during dry years than during wet ones, opportunities exist to deliver SWP Article 21 water during multiyear drought periods. As modeled, deliveries in dry years are often small (less than 5 taf); however, longer drought periods can include several years that support Article 21 deliveries. Annual average Article 21 estimates for drought periods of 4 and 6 years vary greatly and can approach a significant fraction of the long-term average annual estimate, as shown in Table 5-7.

Table 5-7. Estimated Average and Dry-Period Deliveries of SWP Article 21 Water (Existing Conditions, in taf/year)						
	Long-term Average (1921-2003)	Single Dry Year (1977)	Wet Periods			
			2-Year Drought (1976-1977)	4-Year Drought (1931-1934)	6-Year Drought (1987-1992)	6-Year Drought (1929-1934)
2015 Report	56	8	12	41	13	31
2017 Report	50	8	14	16	13	15

Section 6

Historical SWP Delivery Tables for 2007–2016

The State Water Project (SWP) contracts define several types of SWP water available for delivery to its Contractors under specific circumstances: Table A water, Article 21 water, turnback pool water, and carryover water. Many SWP Contractors frequently use Article 21, turnback pool, and carryover water to increase or decrease the amount of water available to them under SWP Table A.

Tables 6-1 through 6-10 list annual historical deliveries by SWP water type for each Contractor for 2007 through 2016. Similar delivery tables are presented for years 2005–2014 in the *State Water Project Delivery Capability Report 2015*. Any differences in values presented in this 2017 report and those in the 2015 report are due to reclassification of deliveries since the production of the 2015 report.

Table 6-1. Historical State Water Project Deliveries, Calendar Year 2007						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	720	-	-	-	720
	Plumas County FCWCD	-	-	-	-	-
	Yuba City	2,327	-	-	-	2,327
	Subtotal	3,047	-	-	-	3,047
North Bay Area	Napa County FCWCD	6,362	3,597	998	-	10,957
	Solano County WA	14,892	8,217	1,822	-	24,931
	Subtotal	21,254	11,814	2,820	-	35,888
South Bay Area	Alameda County FCWCD, Zone 7	32,972	912	2,895	378	37,157
	Alameda County WD	16,541	550	2,103	197	19,391
	Santa Clara Valley WD	38,812	4,840	8,161	469	52,282
	Subtotal	88,325	6,302	13,159	1,044	108,830
San Joaquin Valley Area	Dudley Ridge WD	28,457	8,953	2,000	269	39,679
	Empire West Side ID	397	1,172	515	-	2,084
	Kern County WA	592,423	99,861	19,645	4,683	716,612
	Kings County	4,924	474	305	43	5,746
	Oak Flat WD	3,420	41	69	27	3,557
	Tulare Lake Basin WSD	57,272	12,902	16,459	450	87,083
	Subtotal	686,893	123,403	38,993	5,472	854,761
Central Coastal Area	San Luis Obispo County FCWCD	3,752	24	-	-	3,776
	Santa Barbara County FCWCD	24,760	1,070	1,390	-	27,220
	Subtotal	28,512	1,094	1,390	-	30,996
Southern California Area	Antelope Valley–East Kern WA	74,459	-	4,364	-	78,823
	Castaic Lake WA	44,974	-	4,216	-	49,190
	Coachella Valley WD	72,660	-	-	568	73,228
	Crestline–Lake Arrowhead WA	1,768	-	-	-	1,768
	Desert WA	30,000	-	-	234	30,234
	Littlerock Creek ID	1,380	-	-	-	1,380
	Metropolitan WD of Southern California	1,146,900	166,517	28,098	8,962	1,350,477
	Mojave WA	45,372	-	737	-	46,109
	Palmdale WD	12,780	843	985	100	14,708
	San Bernardino Valley MWD	57,116	-	-	-	57,116
	San Gabriel Valley MWD	10,000	-	-	-	10,000
	San Geronio Pass WA	3,935	-	-	-	3,935
	Ventura County WPD	3,000	-	-	-	3,000
	Subtotal	1,504,344	167,360	38,400	9,864	1,719,968
TOTAL SWP DELIVERIES		2,332,375	309,973	94,762	16,380	2,753,490

Table 6–2. Historical State Water Project Deliveries, Calendar Year 2008						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	9,436	-	-	-	9,436
	Plumas County FCWCD	243	-	-	-	243
	Yuba City	1,923	-	-	-	1,923
	Subtotal	11,602	-	-	-	11,602
North Bay Area	Napa County FCWCD	3,636	1,219	7,363	21	12,239
	Solano County WA	10,436	1,510	12,389	-	24,335
	Subtotal	14,072	2,729	19,752	21	36,574
South Bay Area	Alameda County FCWCD, Zone 7	13,634	-	15,399	-	29,033
	Alameda County WD	4,206	-	8,659	37	12,902
	Santa Clara Valley WD	11,133	-	21,188	88	32,409
	Subtotal	28,973	-	45,246	125	74,344
San Joaquin Valley Area	Dudley Ridge WD	12,260	-	5,949	51	18,260
	Empire West Side ID	-	-	915	-	915
	Kern County WA	275,555	-	2,896	883	279,334
	Kings County	3,187	-	541	8	3,736
	Oak Flat WD	1,929	-	-	5	1,934
	Tulare Lake Basin WSD	32,302	-	281	85	32,668
	Subtotal	325,233	-	10,582	1,032	336,847
Central Coastal Area	San Luis Obispo County FCWCD	8,512	-	-	-	8,512
	Santa Barbara County FCWCD	11,311	-	2,532	40	13,883
	Subtotal	19,823	-	2,532	40	22,395
Southern California Area	Antelope Valley–East Kern WA	31,082	-	10,381	125	41,588
	Castaic Lake WA	18,710	-	12,146	-	30,856
	Coachella Valley WD	42,385	-	-	107	42,492
	Crestline–Lake Arrowhead WA	1,159	-	689	-	1,848
	Desert WA	17,500	-	-	44	17,544
	Littlerock Creek ID	805	-	-	-	805
	Metropolitan WD of Southern California	658,304	-	-	1,689	659,993
	Mojave WA	26,288	-	108	-	26,396
	Palmdale WD	4,226	-	-	19	4,245
	San Bernardino Valley MWD	26,562	-	4,444	-	31,006
	San Gabriel Valley MWD	10,080	-	-	-	10,080
	San Geronio Pass WA	5,419	-	300	-	5,719
	Ventura County WPD	3,798	-	-	-	3,798
	Subtotal	846,318	-	28,068	1,984	876,370
TOTAL SWP DELIVERIES		1,246,021	2,729	106,180	3,202	1,358,132

Table 6–3. Historical State Water Project Deliveries, Calendar Year 2009						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	10,206	-	-	-	10,206
	Plumas County FCWCD	200	-	-	-	200
	Yuba City	2,114	-	-	-	2,114
	Subtotal	12,520	-	-	-	12,520
North Bay Area	Napa County FCWCD	2,723	1,588	4,475	13	8,799
	Solano County WA	7,118	4,444	3,123	-	14,685
	Subtotal	9,841	6,032	7,598	13	23,484
South Bay Area	Alameda County FCWCD, Zone 7	11,746	-	14,583	-	26,329
	Alameda County WD	5,911	-	10,494	8	16,413
	Santa Clara Valley WD	9,188	-	23,867	54	33,109
	Subtotal	26,845	-	48,944	62	75,851
San Joaquin Valley Area	Dudley Ridge WD	13,185	-	7,810	32	21,027
	Empire West Side ID	1,034	-	-	-	1,034
	Kern County WA	325,426	-	56,367	544	382,337
	Kings County	3,153	-	70	5	3,228
	Oak Flat WD	1,825	-	66	3	1,894
	Tulare Lake Basin WSD	35,160	-	1,271	52	36,483
	Subtotal	379,783	-	65,584	636	446,003
Central Coastal Area	San Luis Obispo County FCWCD	9,723	-	-	-	9,723
	Santa Barbara County FCWCD	4,961	-	4,523	25	9,509
	Subtotal	14,684	-	4,523	25	19,232
Southern California Area	Antelope Valley–East Kern WA	13,499	-	18,408	77	31,984
	Castaic Lake WA	14,858	-	9,529	52	24,439
	Coachella Valley WD	40,845	-	-	66	40,911
	Crestline–Lake Arrowhead WA	1,000	-	893	-	1,893
	Desert WA	16,865	-	-	27	16,892
	Littlerock Creek ID	920	-	-	-	920
	Metropolitan WD of Southern California	696,817	-	10,721	1,042	708,580
	Mojave WA	30,300	-	242	-	30,542
	Palmdale WD	2,470	-	3,229	-	5,699
	San Bernardino Valley MWD	26,085	-	9,348	-	35,433
	San Gabriel Valley MWD	11,516	-	-	-	11,516
	San Geronio Pass WA	5,312	-	480	-	5,792
	Ventura County WPD	3,890	-	-	-	3,890
	Subtotal	864,377	-	52,850	1,264	918,491
TOTAL SWP DELIVERIES		1,308,050	6,032	179,499	2,000	1,495,581

Table 6–4. Historical State Water Project Deliveries, Calendar Year 2010

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	807	-	-	-	807
	Plumas County FCWCD	243	-	-	-	243
	Yuba City	2,331	-	-	-	2,331
	Subtotal	3,381	-	-	-	3,381
North Bay Area	Napa County FCWCD	7,275	2,207	2,845	90	12,417
	Solano County WA	13,793	5,298	3,661	-	22,752
	Subtotal	21,068	7,505	6,506	90	35,169
South Bay Area	Alameda County FCWCD, Zone 7	28,694	-	13,104	249	42,047
	Alameda County WD	11,668	-	10,889	14	22,571
	Santa Clara Valley WD	37,850	-	22,471	34	60,355
	Subtotal	78,212	-	46,464	297	124,973
San Joaquin Valley Area	Dudley Ridge WD	19,650	-	9,750	156	29,556
	Empire West Side ID	380	-	166	-	546
	Kern County WA	411,821	-	55,419	3,044	470,284
	Kings County	4,094	-	522	29	4,645
	Oak Flat WD	2,412	-	455	18	2,885
	Tulare Lake Basin WSD	39,835	-	3,199	275	43,309
	Subtotal	478,192	-	69,511	3,522	551,225
Central Coastal Area	San Luis Obispo County FCWCD	3,480	-	277	-	3,757
	Santa Barbara County FCWCD	8,640	-	8,995	140	17,775
	Subtotal	12,120	-	9,272	140	21,532
Southern California Area	Antelope Valley–East Kern WA	35,312	-	20,813	438	56,563
	Castaic Lake WA	37,054	-	14,501	295	51,850
	Coachella Valley WD	69,175	-	7,595	429	77,199
	Crestline–Lake Arrowhead WA	1,357	-	-	-	1,357
	Desert WA	27,875	-	3,135	173	31,183
	Littlerock Creek ID	1,150	-	-	-	1,150
	Metropolitan WD of Southern California	900,210	-	67,783	5,922	973,915
	Mojave WA	41,132	-	20	-	41,152
	Palmdale WD	5,585	-	5,325	59	10,969
	San Bernardino Valley MWD	38,133	-	11,273	-	49,406
	San Gabriel Valley MWD	14,400	-	-	-	14,400
	San Geronio Pass WA	5,226	-	1,608	6	6,840
	Ventura County WPD	4,075	-	-	-	4,075
	Subtotal	1,180,684	-	132,053	7,322	1,320,059
TOTAL SWP DELIVERIES		1,773,657	7,505	263,806	11,371	2,056,339

Table 6–5. Historical State Water Project Deliveries, Calendar Year 2011						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	1,092	-	-	-	1,092
	Plumas County FCWCD	98	-	-	-	98
	Yuba City	2,297	-	-	-	2,297
	Subtotal	3,487	-	-	-	3,487
North Bay Area	Napa County FCWCD	9,426	-	1,388	-	10,814
	Solano County WA	9,620	14,739	-	-	24,359
	Subtotal	19,046	14,739	1,388	-	35,173
South Bay Area	Alameda County FCWCD, Zone 7	39,066	-	11,675	1,319	52,060
	Alameda County WD	24,813	1,959	9,332	506	36,610
	Santa Clara Valley WD	64,538	970	20,491	-	85,999
	Subtotal	128,417	2,929	41,498	1,825	174,669
San Joaquin Valley Area	Dudley Ridge WD	40,141	11,666	5,524	823	58,154
	Empire West Side ID	1,626	138	151	-	1,915
	Kern County WA	753,707	194,119	119,773	16,068	1,083,667
	Kings County	5,294	552	558	152	6,556
	Oak Flat WD	2,644	-	71	-	2,715
	Tulare Lake Basin WSD	39,056	6,909	4,626	1,454	52,045
	Subtotal	842,468	213,384	130,703	18,497	1,205,052
Central Coastal Area	San Luis Obispo County FCWCD	3,340	-	479	-	3,819
	Santa Barbara County FCWCD	29,132	-	9,318	-	38,450
	Subtotal	32,472	-	9,797	-	42,269
Southern California Area	Antelope Valley–East Kern WA	77,549	7,629	5,888	-	91,066
	Castaic Lake WA	34,067	400	9,332	-	43,799
	Coachella Valley WD	88,017	-	-	2,262	90,279
	Crestline–Lake Arrowhead WA	423	-	51	-	474
	Desert WA	36,139	-	-	240	36,379
	Littlerock Creek ID	-	-	-	-	-
	Metropolitan WD of Southern California	1,286,935	181,610	55,540	8,237	1,532,322
	Mojave WA	4,831	-	268	-	5,099
	Palmdale WD	12,294	-	5,019	-	17,313
	San Bernardino Valley MWD	30,916	-	7,210	-	38,126
	San Gabriel Valley MWD	23,040	-	-	-	23,040
	San Geronio Pass WA	8,884	-	1,619	-	10,503
	Ventura County WPD	4,000	-	-	-	4,000
	Subtotal	1,607,095	189,639	84,927	10,739	1,892,400
TOTAL SWP DELIVERIES		2,632,985	420,691	268,313	31,061	3,353,050

Table 6–6. Historical State Water Project Deliveries, Calendar Year 2012						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	17,875	-	-	-	17,875
	Plumas County FCWCD	79	-	-	-	79
	Yuba City	2,695	-	-	-	2,695
	Subtotal	20,649	-	-	-	20,649
North Bay Area	Napa County FCWCD	5,065	-	4,278	64	9,407
	Solano County WA	11,673	-	9,641	-	21,314
	Subtotal	16,738	-	13,919	64	30,721
South Bay Area	Alameda County FCWCD, Zone 7	32,301	-	20,357	179	52,837
	Alameda County WD	11,951	-	8,787	93	20,831
	Santa Clara Valley WD	34,612	-	11,462	222	46,296
	Subtotal	78,864	-	40,606	494	119,964
San Joaquin Valley Area	Dudley Ridge WD	17,694	-	-	112	17,806
	Empire West Side ID	1,468	-	774	-	2,242
	Kern County WA	560,969	-	32,477	2,180	595,626
	Kings County	5,337	-	2,001	21	7,359
	Oak Flat WD	2,596	-	612	-	3,208
	Tulare Lake Basin WSD	53,630	-	32,081	197	85,908
	Subtotal	641,694	-	67,945	2,510	712,149
Central Coastal Area	San Luis Obispo County FCWCD	3,111	-	833	-	3,944
	Santa Barbara County FCWCD	20,874	-	43	-	20,917
	Subtotal	23,985	-	876	-	24,861
Southern California Area	Antelope Valley–East Kern WA	80,694	-	32,854	-	113,548
	Castaic Lake WA	42,707	-	11,350	-	54,057
	Coachella Valley WD	89,928	-	22,663	307	112,898
	Crestline–Lake Arrowhead WA	624	-	-	-	624
	Desert WA	36,238	-	8,461	124	44,823
	Littlerock Creek ID	-	-	-	-	-
	Metropolitan WD of Southern California	1,086,084	-	118,172	4,241	1,208,497
	Mojave WA	4,672	-	6,572	-	11,244
	Palmdale WD	9,959	-	4,736	-	14,695
	San Bernardino Valley MWD	65,102	-	47,870	-	112,972
	San Gabriel Valley MWD	18,720	-	-	-	18,720
	San Geronio Pass WA	5,968	-	4,956	-	10,924
	Ventura County WPD	4,353	-	-	-	4,353
	Subtotal	1,445,049	-	257,634	4,672	1,707,355
TOTAL SWP DELIVERIES		2,226,979	-	380,980	7,740	2,615,699

Table 6-7. Historical State Water Project Deliveries, Calendar Year 2013

Contractor Location	SWP Contractor	SWP Water Type Delivered (acre-feet)				Total SWP Deliveries (acre-feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	9,233	-	-	-	9,233
	Plumas County FCWCD	366	-	-	-	366
	Yuba City	3,360	-	1,490	-	4,850
	Subtotal	12,959	-	1,490	-	14,449
North Bay Area	Napa County FCWCD	2,963	-	9,075	-	12,038
	Solano County WA	5,355	-	17,805	-	23,160
	Subtotal	8,318	-	26,880	-	35,198
South Bay Area	Alameda County FCWCD, Zone 7	14,059	-	21,042	2,596	37,697
	Alameda County WD	4,241	-	15,349	50	19,640
	Santa Clara Valley WD	9,353	-	16,261	10,749	36,363
	Subtotal	27,653	-	52,652	13,395	93,700
San Joaquin Valley Area	Dudley Ridge WD	6,113	-	9,951	5,412	21,476
	Empire West Side ID	1,004	-	482	16	1,502
	Kern County WA	314,466	-	73,303	37,005	424,774
	Kings County	2,851	-	591	1,000	4,442
	Oak Flat WD	583	-	2,200	7	2,790
	Tulare Lake Basin WSD	27,803	-	4,169	8,400	40,372
	Subtotal	352,820	-	90,696	51,840	495,356
Central Coastal Area	San Luis Obispo County FCWCD	1,178	-	2,503	-	3,681
	Santa Barbara County FCWCD	3,252	-	12,233	-	15,485
	Subtotal	4,430	-	14,736	-	19,166
Southern California Area	Antelope Valley–East Kern WA	37,628	-	13,386	-	51,014
	Castaic Lake WA	33,320	-	28,434	-	61,754
	Coachella Valley WD	48,423	-	-	164	48,587
	Crestline–Lake Arrowhead WA	1,368	-	2,000	-	3,368
	Desert WA	19,513	-	-	66	19,579
	Littlerock Creek ID	-	-	-	-	-
	Metropolitan WD of Southern California	619,863	-	106,288	32,267	758,418
	Mojave WA	25,294	-	2,852	-	28,146
	Palmdale WD	4,559	-	3,122	-	7,681
	San Bernardino Valley MWD	26,159	-	4,426	-	30,585
	San Gabriel Valley MWD	10,080	-	-	-	10,080
	San Geronio Pass WA	2,339	-	3,729	1,000	7,068
	Ventura County WPD	2,890	-	-	-	2,890
	Subtotal	831,436	-	164,237	33,497	1,029,170
TOTAL SWP DELIVERIES		1,237,616	-	350,691	98,732	1,687,039

Table 6–8. Historical State Water Project Deliveries, Calendar Year 2014						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	2,596	-	-	-	2,596
	Plumas County FCWCD	251	-	-	-	251
	Yuba City	96	-	4,085	-	4,181
	Subtotal	2,943	-	4,085	-	7,028
North Bay Area	Napa County FCWCD	41	1,444	9,731	-	11,216
	Solano County WA	450	-	9,493	-	9,943
	Subtotal	491	1,444	19,224	-	21,159
South Bay Area	Alameda County FCWCD, Zone 7	1,367	-	17,646	-	19,013
	Alameda County WD	-	-	10,326	-	10,326
	Santa Clara Valley WD	-	-	12,339	79	12,418
	Subtotal	1,367	-	40,311	79	41,757
San Joaquin Valley Area	Dudley Ridge WD	1,783	-	15,783	40	17,606
	Empire West Side ID	104	-	349	-	453
	Kern County WA	1,393	-	24,717	520	26,630
	Kings County	112	-	360	-	472
	Oak Flat WD	-	-	983	-	983
	Tulare Lake Basin WSD	3,942	-	3,181	-	7,123
	Subtotal	7,334	-	45,373	560	53,267
Central Coastal Area	San Luis Obispo County FCWCD	379	-	2,693	-	3,072
	Santa Barbara County FCWCD	289	-	10,533	-	10,822
	Subtotal	668	-	13,226	-	13,894
Southern California Area	Antelope Valley–East Kern WA	2,152	-	12,345	111	14,608
	Castaic Lake WA	451	-	7,743	-	8,194
	Coachella Valley WD	6,918	-	-	-	6,918
	Crestline–Lake Arrowhead WA	83	-	645	-	728
	Desert WA	2,788	-	-	-	2,788
	Littlerock Creek ID	106	-	-	-	106
	Metropolitan WD of Southern California	59,900	-	223,358	-	283,258
	Mojave WA	3,347	-	2,228	-	5,575
	Palmdale WD	1,005	-	3,670	-	4,675
	San Bernardino Valley MWD	-	-	6,320	-	6,320
	San Gabriel Valley MWD	1,434	-	-	-	1,434
	San Geronio Pass WA	603	-	4,572	-	5,175
	Ventura County WPD	93	-	-	-	93
	Subtotal	78,880	-	260,881	111	339,872
TOTAL SWP DELIVERIES		91,683	1,444	383,100	750	476,977

Table 6–9. Historical State Water Project Deliveries, Calendar Year 2015						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	3,315	-	-	-	3,315
	Plumas County FCWCD	285	-	-	-	285
	Yuba City	2,400	-	604	-	3,004
	Subtotal	6,000	-	604	-	6,604
North Bay Area	Napa County FCWCD	5,365	690	3,896	35	9,986
	Solano County WA	2,020	-	15,718	-	17,738
	Subtotal	7,385	690	19,614	35	27,724
South Bay Area	Alameda County FCWCD, Zone 7	4,686	-	3,295	97	8,078
	Alameda County WD	-	-	2,233	51	2,284
	Santa Clara Valley WD	-	-	2,858	120	2,978
	Subtotal	4,686	-	8,386	268	13,340
San Joaquin Valley Area	Dudley Ridge WD	7,414	-	1,570	55	9,039
	Empire West Side ID	578	-	46	-	624
	Kern County WA	173,581	-	43,265	707	217,553
	Kings County	698	-	333	11	1,042
	Oak Flat WD	696	-	348	-	1,044
	Tulare Lake Basin WSD	16,359	-	571	105	17,035
	Subtotal	199,326	-	46,133	878	246,337
Central Coastal Area	San Luis Obispo County FCWCD	3,411	-	-	-	3,411
	Santa Barbara County FCWCD	4,973	-	1,089	55	6,117
	Subtotal	8,384	-	1,089	55	9,528
Southern California Area	Antelope Valley–East Kern WA	21,810	-	5,154	174	27,138
	Castaic Lake WA	11,068	-	4,121	-	15,189
	Coachella Valley WD	27,670	-	-	-	27,670
	Crestline–Lake Arrowhead WA	154	-	247	-	401
	Desert WA	11,150	-	-	67	11,217
	Littlerock Creek ID	460	-	-	-	460
	Metropolitan WD of Southern California	379,706	-	35,675	1,374	416,755
	Mojave WA	16,538	-	1,871	-	18,409
	Palmdale WD	2,420	-	-	26	2,446
	San Bernardino Valley MWD	17,737	-	9,012	123	26,872
	San Gabriel Valley MWD	5,759	-	-	-	5,759
	San Geronio Pass WA	3,343	-	135	-	3,478
	Ventura County WPD	1,000	-	-	-	1,000
	Subtotal	498,815	-	56,215	-	556,794
TOTAL SWP DELIVERIES		724,596	690	132,041	3,000	860,327

Table 6–10. Historical State Water Project Deliveries, Calendar Year 2016						
Contractor Location	SWP Contractor	SWP Water Type Delivered (acre–feet)				Total SWP Deliveries (acre–feet)
		Table A	Article 21	Carryover	Turnback	
Feather River Area	Butte County	15,634	-	-	-	15,634
	Plumas County FCWCD	387	-	-	-	387
	Yuba City	1,229	-	-	-	1,229
	Subtotal	17,250	-	-	-	17,250
North Bay Area	Napa County FCWCD	13,138	3,319	-	295	16,752
	Solano County WA	12,595	-	4,130	-	16,725
	Subtotal	25,733	3,319	4,130	295	33,477
South Bay Area	Alameda County FCWCD, Zone 7	41,987	-	8,450	819	51,256
	Alameda County WD	14,280	-	8,400	-	22,680
	Santa Clara Valley WD	40,214	-	32,863	-	73,077
	Subtotal	96,481	-	49,713	819	147,013
San Joaquin Valley Area	Dudley Ridge WD	17,372	-	1,656	461	19,489
	Empire West Side ID	1,800	-	22	-	1,822
	Kern County WA	458,759	-	-	3,533	462,292
	Kings County	2,466	-	1,095	95	3,656
	Oak Flat WD	832	-	1,023	-	1,855
	Tulare Lake Basin WSD	41,126	-	1,135	126	42,387
	Subtotal	522,355	-	4,931	4,215	531,501
Central Coastal Area	San Luis Obispo County FCWCD	4,199	-	-	-	4,199
	Santa Barbara County FCWCD	12,003	-	917	-	12,920
	Subtotal	16,202	-	917	-	17,119
Southern California Area	Antelope Valley–East Kern WA	56,148	-	6,054	1,471	63,673
	Castaic Lake WA	31,147	-	2,241	-	33,388
	Coachella Valley WD	52,922	-	-	-	52,922
	Crestline–Lake Arrowhead WA	1,873	-	-	-	1,873
	Desert WA	21,327	-	-	566	21,893
	Littlerock Creek ID	1,380	-	-	-	1,380
	Metropolitan WD of Southern California	1,006,900	-	-	6,871	1,013,771
	Mojave WA	32,045	-	1,170	-	33,215
	Palmdale WD	7,805	-	-	-	7,805
	San Bernardino Valley MWD	57,815	-	2,348	-	60,163
	San Gabriel Valley MWD	17,280	-	-	-	17,280
	San Geronio Pass WA	8,683	-	933	-	9,616
	Ventura County WPD	3,000	-	-	-	3,000
	Subtotal	1,298,325	-	12,746	8,908	1,319,979
TOTAL SWP DELIVERIES		1,976,346	3,319	72,437	14,237	2,066,339