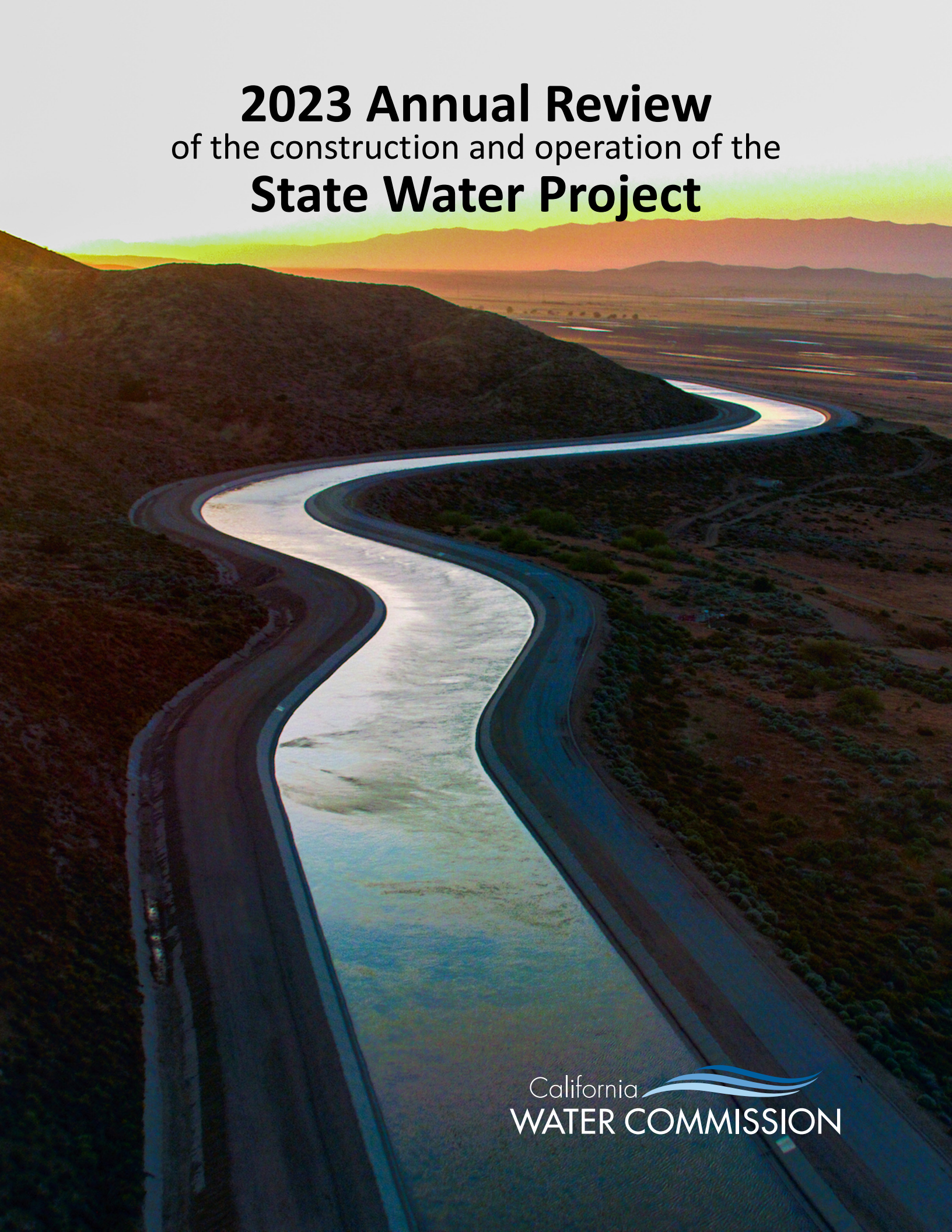
# 2023 Annual Review

of the construction and operation of the

# State Water Project



California
WATER COMMISSION

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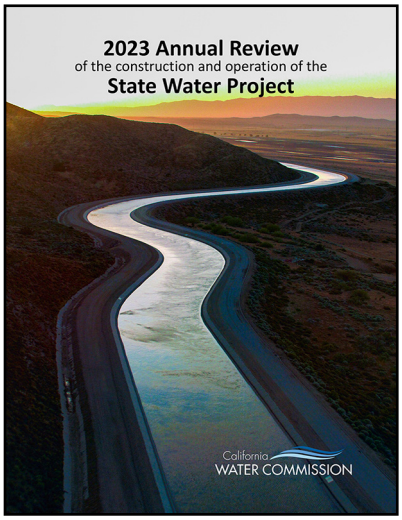


*On the cover: A windy stretch of the East Branch California Aqueduct in Palmdale, California, located in Los Angeles County.*
*Photo courtesy Department of Water Resources*

## 2023 CALIFORNIA WATER COMMISSION

**Matthew Swanson, Chair**
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**Danny Curtin**
**Kimberly Gallagher**
**Alexandre Makler**
**Sandra Matsumoto**
**Jose Solorio**

## Introduction

The State Water Project (SWP) is a no-fail system. Its continued operation through changing hydrology, climatic conditions, demographics, and economic shifts is essential to the viability of California. In 2023, California started the year preparing for drought and, within a few months, was responding to record-breaking rain and flood emergencies. The SWP is managed flexibly to accommodate these drastic swings in weather so that it can continue to balance water delivery, Delta water quality and species obligations.

In addition to responding to real-time shifts in hydrology, the SWP is confronting a transitional era that demands innovative infrastructure solutions – including recognizing the importance of "natural" infrastructure, such as rivers, streams, floodplains, and mountain meadows – and requires advanced planning and strategic action to modernize aging facilities and adapt them to changing conditions. As California's rapid swing from severe drought to extreme flooding demonstrates, the specter of climate change has arrived, demanding attention now while promising continued change in the future. Current climate research indicates the state will see bigger swings from extreme dry conditions to larger and more powerful storms that will increase the state's flood risk. It is incumbent upon the Department of Water Resources (DWR) as the manager of the SWP – as well as water managers across the state – to acknowledge the interconnectedness of managing natural and built infrastructure and to work with partners to advance more integrated, flexible, and reliable water management systems in response to the state's changing climate. This is no small feat for a system as complex as the State Water Project.

Planned, constructed, and operated by DWR, the SWP is the nation's largest state-built, multi-purpose, user-financed water project. Built in the 1960s, the system consists of 36 water storage facilities and 700 miles of rivers, pipelines,

## California Water Commission

The nine-member California Water Commission uses its public forum to explore water management issues from multiple perspectives and to formulate recommendations to advise the director of the California Department of Water Resources, and as appropriate, the California Natural Resources Agency, the Governor and Legislature on ways to improve water planning and management in response to California's changing hydrology. For more information regarding the California Water Commission, visit cwc.ca.gov.

and canals that supply water to 27 million people and irrigate 750,000 acres of farmland. Thirty percent of SWP water is used for irrigation, mostly in the San Joaquin Valley, and the other 70 percent is used for residential, municipal, and industrial use. In addition to its primary purpose of supplying water, the SWP also provides flood protection, offers recreational opportunities such as boating and hiking, and generates hydroelectric power. Twenty-three pumping plants move water around the state, powered by a system of power-generation and power-recovery plants. The SWP is the fourth largest power generator in the state, and will be carbon neutral by 2035. DWR operates the SWP in coordination with the federal U.S. Bureau of Reclamation's (USBR) Central Valley Project (CVP), which also moves water throughout California.

DWR administers more than 41,000 acres of SWP land and waters comprised of a variety of habitat types including open water, emergent wetlands, annual grasslands, oak woodlands, oak/pine woodlands, and chaparral, which support multiple state and federal Endangered Species Act-listed wildlife species. Spring- and fall-run Chinook Salmon, steelhead, and green sturgeon are all supported in the lower Feather River by SWP operations during their natural spawning and rearing periods. The SWP's Feather River Fish Hatchery generally produces two million spring-run Chinook Salmon, six million fall-run Chinook Salmon, and 450,000 steelhead annually. Fifty-plus years of invasive species, water quality, and food web monitoring paired with extensive Environmental Laboratory Accreditation Program-certified laboratory services allow the SWP scientists the ability to monitor long-term status and trends of the environment as well as advise on real-time operations to support ecosystem health and a sustainable water supply.

While the SWP was under construction, the public agencies and local water districts that receive water from the SWP signed long-term water supply contracts with DWR. Today, these 29 public agencies and local water districts are collectively known as the SWP contractors, and they serve communities in the Central Valley, desert, and coast of California, providing the water on which agriculture, industry, and households depend. The water supply contracts that

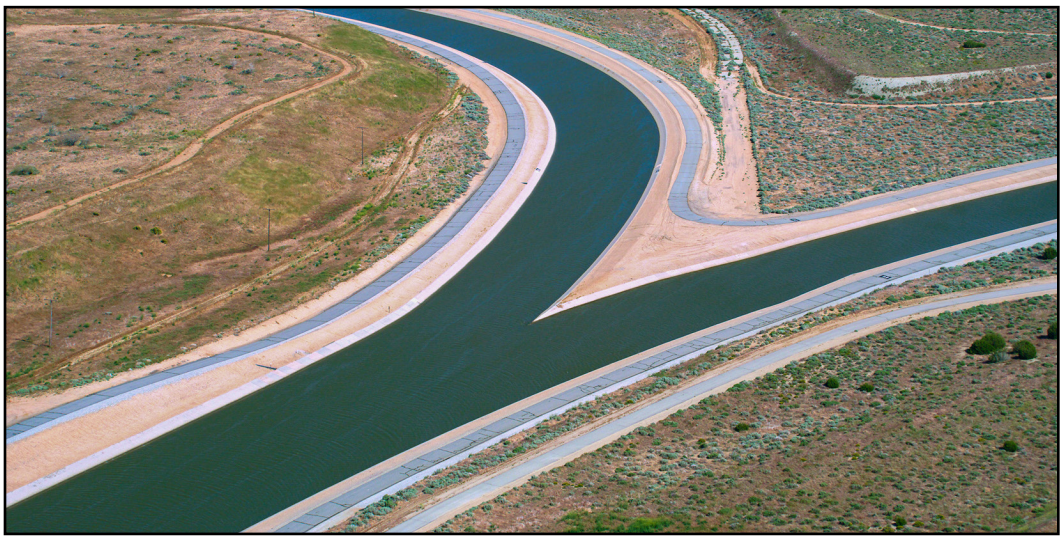


Photo courtesy DWR

The California Aqueduct bifurcates in the West Branch and East Branch as it travels into the Southern California region at the border of Kern and Los Angeles Counties.

were signed six decades ago and recently renegotiated specify the maximum amount of SWP water a contractor may request annually. However, the amount of SWP water available for delivery varies based on rainfall, snowpack, runoff, water in reservoirs, pumping capacity in the Sacramento-San Joaquin Delta, and operating constraints that protect fish, wildlife, and Delta water quality. As California's hydrologic patterns shift, water deliveries will become increasingly variable, impacting water supply reliability for the SWP's users.

The California Water Plan Update 2023 notes that the resilience of "backbone" infrastructure like the SWP is intrinsically linked to the resilience of natural infrastructure systems, such as source watersheds and aquifers, and recommends evaluating adaptive operations of the SWP to accommodate climate change, and increasing SWP storage and conveyance capacity to help regulate supplies under increasingly extreme hydrology.

The California Water Commission (Commission) uses its role as a public forum to provide transparency around the operations of the SWP. Water Code section 165 requires the Commission to conduct an annual review of the progress of the construction and operation of the SWP and to provide that report to the Legislature. In 2023, DWR made eight presentations to the Commission on various SWP topics. These presentations are a continuation of the public transparency that the Commission has provided since the construction of the SWP: They help the public stay informed of DWR's efforts, and they provide the basis of the findings and recommendations that the Commission makes to DWR and the Legislature regarding operation of the SWP. This review highlights SWP planning and operations in 2023 and includes findings and specific recommendations for DWR to keep the Commission apprised of operations and construction activities in 2024.


State Water Project Facilities
DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA
Shasta Lake
Sacramento River
Antelope Lake
Lake Davis
Frenchman Lake
Grizzly Valley Pipeline
Thermalito Diversion Dam Powerplant
Thermalito Forebay
Thermalito Pumping-Generating Plant
Thermalito Afterbay
Lake Oroville
Hyatt Powerplant
Feather R.
Barker Slough Pumping Plant
North Bay Aqueduct
Cordelia Pumping Plant
Clifton Court Forebay
Skinner Fish Facility
Banks Pumping Plant
South Bay Pumping Plant
Del Valle Pumping Plant
South Bay Aqueduct
Lake Del Valle
Gianelli Pumping-Generating Plant
O'Neill Forebay
Dos Amigos Pumping Plant
San Luis Reservoir
Los Banos Reservoir
Little Panoche Reservoir
San Joaquin River
California Aqueduct
Badger Hill Pumping Plant
Devil's Den Pumping Plant
Bluestone Pumping Plant
Polonio Pass Pumping Plant
Las Perillas Pumping Plant
Coastal Branch Aqueduct
Teerink Pumping Plant
Chrisman Pumping Plant
Edmonston Pumping Plant
Tehachapi East Afterbay
Alamo Powerplant
Buena Vista Pumping Plant
Oso Pumping Plant
West Branch
Quail Lake
Warne Powerplant
Pyramid Lake
Castaic Powerplant (LADWP)
Castaic Lake
East Branch
Pearblossom Pumping Plant
Mojave Siphon Powerplant
Devil Canyon Powerplant
Silverwood Lake
East Branch Extension
Greenspot Pumping Station
Crafton Hills Pumping Station
Crafton Hills Reservoir
Cherry Valley Pumping Station
Citrus Reservoir
Citrus Pumping Station
Lake Perris
N
Miles 0 25 50 100 200

Photo courtesy California Water Commission

California Water Commissioners, from left, Jose Solorio, Vice-chair Fern Steiner, Sandi Matsumoto, Danny Curtin, and Kim Gallagher on the Oroville Dam. The September 2023 Commission meeting took place in Oroville, where DWR staff educated Commission members, staff, and the public on the dam's function and history, went over the operations of the spillway, and described the current cosmetic work being done as proactive maintenance.

## Findings

**The Commission finds that, in 2023 DWR:**

- Operated the SWP to respond to the hydrologic extremes experienced in 2023, planning for and responding to drought and flood at the same time.
- Continues to plan and prepare the SWP for extreme dry or wet conditions.
- Apprised the Commission of its financial goals, SWP budget, and cost projections, indicating that its 2023 approved SWP budget was $958 million, including operations and capital costs.
- Executed contract extension amendments with 27 SWP Contractors to ensure affordable, long-term financing of SWP capital needs.
- Provided oversight on SWP assets, ensuring they perform consistently, meet engineered standards, and result in the best possible reliability.
- Improved its ability to maximize asset performance and reliability by using new technology to capture and use data.
- Planned to incrementally reduce the SWP's greenhouse gas emissions in order

to put the SWP on target to meet the goal of using 100 percent clean energy by 2035.

- Positioned the SWP to support the state's grid reliability and clean energy goals through an efficient and effective power portfolio.
- Informed the Commission about key construction activities undertaken in the past year to manage and maintain the SWP, including maintenance needs on the Oroville, Cedar Springs, and Pyramid Dam spillways.

## Recommendations

**The Commission recommends that DWR:**

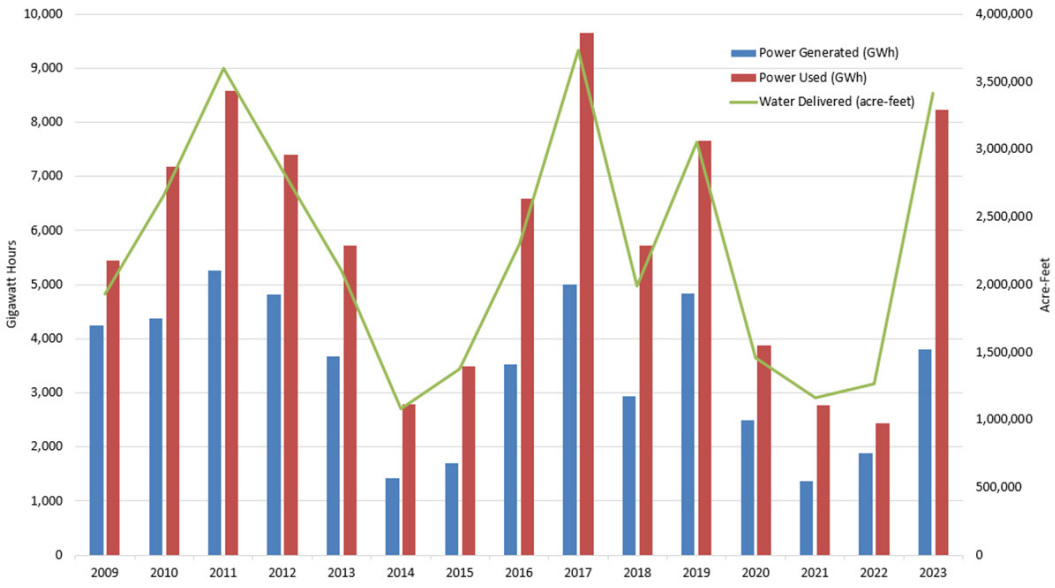
- Maintain open and transparent communication with the Commission; state, local, and federal agencies; interested parties; and the public as they prepare the SWP for another potentially wet water year.
- Move boldly and swiftly to incorporate natural and innovative infrastructure solutions to address challenges associated with climate change.
- Accelerate operational changes that allow the SWP to better address extreme hydrology, such as forecast-informed reservoir operation.
- Engage SWP Contractors and other partners to identify opportunities for and to implement groundwater recharge.
- Quickly and strategically advance projects that will dedicate flows in perpetuity and create durable habitat to sustain ecosystem functions.
- Forecast operational, maintenance, and capital costs needed to address aging infrastructure and climate change, and develop a plan for financing the SWP into the future.
- Continue to reduce its carbon footprint and make the state's power portfolio 100 percent renewable and carbon neutral by December 2035.
- Keep the Commission apprised of its current construction activities and long-term plans for aging infrastructure repair.
- Work with Commission staff to arrange in-person visits by the Commissioners to SWP facilities and project sites.

**Table 1: SWP Water and Power Statistics[1]**

| Year | Water Delivered (acre-feet) | Power Generated (GWh/year) | Power Used (GWh/year) |
|---|---|---|---|
| 2000 | 3,584,667 | 6,832 | 8,518 |
| 2001 | 2,042,118 | 4,588 | 6,358 |
| 2002 | 2,850,215 | 5,631 | 8,191 |
| 2003 | 3,167,604 | 6,117 | 8,862 |
| 2004 | 3,119,578 | 6,887 | 9,661 |
| 2005 | 3,627,004 | 5,661 | 8,282 |
| 2006 | 3,691,568 | 7,515 | 9,109 |
| 2007 | 2,996,629 | 6,410 | 9,276 |
| 2008 | 1,950,968 | 4,100 | 5,701 |
| 2009 | 1,933,735 | 4,255 | 5,438 |
| 2010 | 2,660,960 | 4,368 | 7,184 |
| 2011 | 3,596,749 | 5,258 | 8,583 |
| 2012 | 2,848,082 | 4,810 | 7,404 |
| 2013 | 2,107,572 | 3,679 | 5,721 |
| 2014 | 1,079,839 | 1,426 | 2,780 |
| 2015 | 1,375,536 | 1,699 | 3,483 |
| 2016 | 2,299,679 | 3,535 | 6,598 |
| 2017 | 3,732,527 | 5,011 | 9,652 |
| 2018 | 1,984,723 | 2,933 | 5,723 |
| 2019 | 3,049,485 | 4,842 | 7,662 |
| 2020 | 1,457,500 | 2,484 | 3,877 |
| 2021 | 1,160,082 | 1,371 | 2,771 |
| 2022 | 1,267,989 | 1,891 | 2,434 |
| 2023 | 3,415,279 | 3,809 | 8,226 |

1 Source: Department of Water Resources' State Water Project Analysis Office. (In addition to Table A water, reported deliveries include Carryover, Article 21, Flexible Storage withdrawal, other SWP deliveries such as Advanced Table A and Human Health & Safety and other non-SWP deliveries such as Settlement, Permit, Dry Purchase, Temporary Transfer and Water Bank Recoveries).

**Figure 1: SWP Water Deliveries and Power**




## SWP Water Deliveries, Power Generation, and Use

The SWP delivered 3,415,279 acre-feet of water in 2023. The initial allocation to SWP Contractors was 5 percent on December 1, 2022, then increased to 30 percent in January 2023, 35 percent in February, 75 percent in March, and, for the first time since 2006, 100 percent in April 2023. Allocations are adjusted monthly, driven by the hydrology forecast, planned storage and exports, Delta water quality and flow requirements, SWP Contractor demands, and CVP operations. The contractors' allocations were based on their maximum Table A amount, which equals 4,172,786 acre-feet for all 29 SWP Contractors combined. During 2023, the SWP facilities generated 3,809 gigawatt hours (GWh) of energy. During the same period, the SWP used 8,226 GWh of energy.[3]

Table 1 displays recent years' water deliveries and energy generation and usage. In general, SWP power usage increases with SWP water deliveries. The large year-over-year increase was due to the increased hydrology and 100 percent allocation.

## 2022 Planning and Operations

The SWP is operated in real time, adjusting water releases and exports to meet water supply and downstream flow and water quality requirements. Many factors influence this real-time decision making. The SWP's objectives are to provide downstream flood risk reduction, provide water supply to meet minimum health and safety needs, meet environmental needs to protect endangered species, conserve water storage to meet future critical needs, and deliver water based on priority.

## SWP Water Deliveries

**Table A:** Table A Water is the allocated amount of SWP water that the state agreed to make available to an SWP Contractor for delivery during the calendar year. Table A amounts determine the maximum water a contractor may request each year from DWR. The state and SWP contractors also use Table A amounts to serve as a basis for allocation of some SWP costs among the contractors.

**Carryover:** SWP Contractors can elect to store SWP water outside of their respective service areas and carry the water over to the following year for use in their service areas.

**Article 21:** Article 21 water is water that an SWP Contractor can take over the approved and scheduled Table A amounts for the current year. Article 21 water is only available for delivery on a short-term basis as determined by DWR when water is still available after operational requirements for SWP water deliveries, water quality, and Sacramento-San Joaquin Delta requirements are met. Article 21 water is typically only available in wet water years.

**Flexible Storage Withdrawal:** Allows SWP Contractors participating in the repayment of capital cost of Castaic Lake and Lake Perris to withdraw water in excess of approved deliveries. Participating contractors are given five years to replace withdrawn stored water with approved SWP or non-SWP water.

At the end of Water Year 2022, the entire state was experiencing some form of extreme drought or dry conditions. The 2023 Water Year planning cycle began in November, with conditions well below average following three drought years. In January 2023, conditions took a significant turn with a series of atmospheric rivers and cold storms, resulting in surface storage improvement, above-average precipitation, record-setting snowpack, and very high flows in the Bay-Delta. Due to spring storms, flood control operations were initiated at Lake Oroville in March; about 2.4 million acre-feet (MAF) of water spilled during the flood event. During periods of excess natural flows, the SWP operations strategy is to maximize Delta exports while providing flows for fisheries, minimize Oroville releases to build storage for future dry conditions (within flood control constraints), and to fill San Luis and southern reservoirs.

On the whole, this past winter's storms provided a huge boost to the SWP. During Water Year 2023, Lake Oroville water levels recovered and had the single biggest increase in history. The SWP captured a total of 3.5 million acre-feet of water in reservoirs since December 1, 2022. The lake filled (3.5 MAF) in early June. During the summer months, DWR maximized release of stored water in Lake Oroville for water supply purposes and to meet Bay-Delta downstream water quality and flow requirements. At the end of Water Year 2023 (September 30, 2023), Lake Oroville was at 136 percent of the historical average, and 73 percent of capacity with the available flood control space required by the U.S. Army


Photo by Josh Baar/DWR

Floodwaters from the March storms have cut across 6th Avenue south of Corcoran, in Kings County. The floodwaters are reforming Tulare Lake. Once the largest freshwater lake west of the Mississippi River, Tulare Lake was largely drained in the late 19th and early 20th centuries.

Corps of Engineers Water Control Manual. San Luis Reservoir, jointly managed with USBR, was at 190 percent of the historical average, 81 percent of capacity.

With much improved surface storage going into Water Year 2024, DWR continues to plan and prepare for extreme dry or wet conditions. At the end of the Water Year, DWR sets its carryover storage targets in the event the next year is dry. The planning cycle for 2024 SWP Contractor allocations began in November, with ongoing coordination with local, state, and federal agencies.

## Maintaining Operational Flexibility

The SWP must adapt its operations and increase its resilience to the hydrologic extremes caused by climate change, including dealing with drought and flood at the same time. Having flexibility in the way the SWP is operated is an important way to improve reliability. Throughout the system, many features provide this flexibility, and many of the investments being made by the SWP can be thought of as efforts to either restore or improve operational flexibility.

DWR must address the challenges that reduce and limit the system's flexibility, such as subsidence, aging infrastructure, rules governing Delta exports to support

## Highlights of Water Year 2023 include:

- The re-direction of 25,000 acre-feet of flood flows through the Kern River Intertie into the California Aqueduct.
- 400,000 acre-feet of surplus flows to the SWP Contractors to replenish local surface and groundwater storage.
- Lake Oroville and San Luis Reservoir at capacity.

- 100 percent SWP Contractor allocation.
- Excess flows into the Delta much of the spring and summer, which were beneficial for listed and endangered species.

ecosystems, and changing environmental conditions. Some specific initiatives meant to improve flexibility include the California Aqueduct Subsidence Program, the Delta Conveyance Project, and the Asset Management Program.

Subsidence of the California Aqueduct reduces its conveyance capacity and restricts flexibility. There can be a financial impact to not being able to run the Aqueduct at full capacity. Having the full capacity in the Aqueduct allows DWR to pump when energy on the electrical grid is more plentiful, with resulting lower prices, and throttle back when energy is more scarce and prices are high. Having full Aqueduct capacity also allows DWR to move as much water as possible during times of high water. Having storage within the Aqueduct between the check structures also provides some flexibility in operations. This operational flexibility along the Aqueduct is most constrained by the effects of subsidence when there is a lot of water available in the system. To fix subsidence issues and restore the operational flexibility within the Aqueduct will require a substantial investment; estimates are around a billion dollars over the first 10 years, with additional substantial investments needed after that.

The Sacramento-San Joaquin Delta is at the center of California's water distribution system. The need to balance water supply and ecosystem protection reduces SWP operational flexibility in the Delta. The Harvey O. Banks Pumping Plant, which lifts water into the beginning of the California Aqueduct in the Delta, has a number of small pumps, allowing DWR to finetune the volume of Delta pumping, minimizing impacts to the ecosystem while maximizing supply. Once water moves out of the Delta, the San Luis Reservoir offers valuable storage to meet water demand in the southern part of the state outside the ecosystem

constraints of the Delta. San Luis also provides emergency storage for extreme droughts. The proposed Delta Conveyance Project would further promote flexibility by protecting against future water supply losses caused by climate change, sea level rise, and earthquakes and helping ensure that the SWP can capture, move, and store water during big storm events.

The operational flexibility of the system depends greatly on the system's many parts operating as intended when needed. As infrastructure ages, the likelihood of failure can increase if the infrastructure is not well maintained. DWR's Asset Management Program improves management of the life cycle of both aging and new SWP assets by unifying and improving existing practices under a comprehensive, risk-informed, data-driven, decision-making framework that incorporates existing Operations and Maintenance (O&M) and industry best practices. The Asset Management Program ensures optimal performance by SWP assets, thus maintaining operational flexibility, which in turns improves water supply reliability.

## Annual Budget and Cost Planning

DWR annually plans its budget for SWP operation, maintenance, and capital improvements, a process that is integrated with the state budget process. The approved SWP budget for calendar year 2023 was $958 million: $306 million in capital improvement projects, and $652 million for O&M.

Annual budget planning involves reviewing annual programs, extraordinary activities, and capital cost projections and conducting an analysis to forecast future revenue needs. DWR considers personnel, operating expenses and equipment, and capital project costs. The SWP costs are for water supply and other purposes such as recreation and flood control. Costs are fairly and equitably allocated across partners for joint-use facilities, by project purposes and by cost components, and distributed to SWP Contractors through annual charges.

DWR bills the 29 SWP Contractors annually through the Statement of Charges (SOCs) based on the projected costs and true-up of the historical costs. The SOCs, which make up 90 percent of the SWP revenue, only include the water supply and power generation costs that are reimbursable by the contractors. The SOCs are issued no later than the end of June annually for the next calendar year. During annual budget planning (September through December), the plans for the next calendar year are validated by DWR through project planning and prioritization. DWR may make changes due to unplanned work, therefore requiring adjustment of the budget even though the SOCs have been issued to the SWP Contractors. The objective of annual planning is to prioritize work activities and maintain a budget in line with the issued SOCs.

Having a solid, sustainable financing plan is critical to the SWP. Without a reliable financing plan, the SWP will not be able to collect revenues to sustain its operation and capital improvement, resulting in significant impacts to water

Photo by Ken James/DWR

A small cloud mist formed as water flows over the four energy dissipator blocks at the end of the Lake Oroville main spillway. DWR increased the water release down the main spillway from 4,000 to 8,000 cubic feet per second. Main spillway releases continued to manage lake levels in anticipation of rain and snowmelt.

users in the state. SWP annual revenue is more than $1 billion, not counting the revenue from power sale, which was $104.7 million in 2022. Funding for the SWP primarily comes from the 29 SWP Contractors. Other funding sources include USBR, which contributes funding for facilities that are jointly operated; revenue from power generation and sales; and the Davis-Dolwig Fund, annually appropriated under a 60-year-old state law that specifies that the cost of fish and wildlife enhancements and recreation components of the SWP be paid for from the State General Fund. Funds are used for O&M, debt service payments for capital projects, and other associated financing costs.

## Water Supply Contract Extension Amendment Implementation

DWR entered into long-term water supply contracts with water agencies in the 1960s. Under the contract terms, DWR provides water service from the SWP to 29 SWP Contractors and recoups all costs associated with providing this service for water supply and power generation over the repayment period of the SWP. The contracts originally included terms with ending dates that ranged from

November 2035 to August 2042, depending on when each specific contract was executed. The Water Supply Contract Extension Amendments finalized in 2018 extend the contracts for 50 more years to secure long-term financing and help mitigate cost compression to the contractors. By extending capital financing from 12 years (with the original contract payment terms ending by the end of 2035) to 30 years (typical long-term bond terms for repayment), the contract extension amendments help make the SWP more affordable.

The majority of the capital costs associated with the development and maintenance of the SWP are financed using water system revenue bonds. These bonds have historically been sold with 30-year terms, but bonds cannot be sold with maturity dates that extend beyond the year 2035, the year the original contracts begin to expire. Issuance of bonds with shorter repayment periods (15-year bonds versus 30-year bonds, for instance) would compress the timeframe for repayment and result in higher annual charges.

The Water Supply Contract Extension Amendment will allow DWR to sell bonds with 30-year terms or longer, commensurate with the economic life of the project being financed. Longer bond terms ensure the debt service on these bonds remains affordable to SWP contractors and their water customers. As of this writing, DWR and 27 of the 29 SWP Contractors have approved and executed the contract extension amendment agreement that took effect on January 1, 2023. DWR is working with the final two contractors to extend their contracts.

## State Water Project Maintenance Management Program

Historically, DWR has seen a steady increase in SWP O&M costs due to inflation, the rising cost of labor, and aging of the SWP infrastructure. The O&M Maintenance Management Program, part of the SWP's broader Asset Management effort, was established to oversee maintenance on all conveyance and storage assets managed by the SWP, ensuring they perform consistently and meet engineered standards to provide the best possible asset reliability. The program modernizes O&M maintenance practices, introduces the latest technology, ensures that data is captured efficiently, and provides for analysis to achieve maximum asset performance and reliability, while also being cost effective.

The Maintenance Management Program established centralized maintenance leadership, created asset engineering positions in headquarters and field divisions, realigned priorities to include preventative maintenance, balanced maintenance approaches, engineered development of maintenance plans for all assets, and implemented SAP software as a system of record.

SAP Asset Manager is a mobile tablet application that encompasses a series of processes required to assure superior asset performance, allowing workers to document maintenance, inspection and repair activities on mission critical assets; view asset schematics, history, and dependencies; generate notifications and work

Photo courtesy/DWR

An aerial view of the Harvey O. Banks Delta Pumping Plant, located in Alameda County, which lifts water into the California Aqueduct. It was renamed from the Delta Pumping Plant to the Harvey O. Banks Delta Pumping Plant in June 1981, to honor the first Director of the California Department of Water Resources.

orders; report worker's status, progress, and location; collect signatures at the point of performance; attach photos and videos; and install and tag equipment with QR codes, radio frequency identification, and geotags.

## SB 1020: SWP's Pathway to 100% Clean Energy by 2035

As the fourth-largest zero-emissions hydropower energy producer in the state, DWR must find innovative ways to reduce its carbon footprint. Senate Bill (SB) 1020, approved in September 2022, requires 100 percent of electricity procured to serve all state agencies to be from eligible renewable energy resources and zero-carbon resources by December 2035. The SWP currently has 15 to 20 percent of the additional clean energy needed in its portfolio, and will need 80 to 85 percent of additional clean energy resources capacity to meet its 2035 target.

SWP's energy demand changes from year to year, making it difficult to set the right target to meet a 100 percent clean energy portfolio. Under-procurement of renewable energy results in not meeting the target. Over-procurement of renewable energy leads to increased costs to water customers. DWR operates the

**Energy Roadmap Mission Statement**

The SWP aims to ensure water supply reliability, respond to market evolution, and make prudent investments to achieve California's clean energy goals.

SWP, when feasible, to consume energy when renewable energy is abundant, and not during hours when higher fossil fuel generation is dispatched to the energy grid. As California's energy grid becomes greener, SWP's carbon footprint will be reduced.

The Renewable Energy Procurement Plan (REPP) is DWR's plan to incrementally reduce its greenhouse gas emissions by transitioning SWP energy use from unspecified grid energy that can be composed of thermal resources to renewable resources. DWR structured the REPP to incrementally increase procurements as the renewable energy market matures. By 2035, DWR's goal is for the SWP to consume energy from large hydro sources, small hydro sources, zero-carbon resources, and eligible renewable energy resources. SB 1020 does not specify interim targets or milestones. Annual targets within the REPP are not hard targets, and actual procurements may be in smaller or larger amounts, or shifted from year to year.

## Energy Roadmap

Released in 2022, the SWP Energy Roadmap identifies short-, mid-, and long-term opportunities and challenges for energy investments and strategies and positions the SWP to support the state's grid reliability through an efficient and effective power portfolio, helping DWR and the 29 SWP Contractors achieve their water supply reliability and the clean energy goals required as a result of SB 1020. At the time of the development and release of the SWP Energy Roadmap, SWP's 100 percent renewable and zero-carbon power portfolio was targeted for 2045 per California Senate Bill 100. With the passing of SB 1020 in September 2022, achievement of SWP's clean energy portfolio target has been accelerated to 2035.

In the near term, DWR will work with partners to advance clean energy goals, continue to consider the best approach, and monitor the market so that it can adjust SWP operations to improve the utilization of renewable generation whenever possible. Over the medium term, DWR will, upon confirmation of the feasibility, risk, and cost, look to integrate solar and/or battery storage at select pumping plants, and coordinate with SWP Contractors to promote demand flexibility. For the long term, DWR will develop plans to achieve a 100 percent renewable and zero-emissions power portfolio by 2035, which will include a plan for the Lodi Energy Center. DWR plans also will address how to maintain such a portfolio while the rest of California achieves the same requirements in 2045 and will inform energy policy to promote a resilient and efficient power market design.

Photo courtesy/DWR

Water from the California Aqueduct flows into the Ira J. Chrisman Wind Gap Pumping Plant, part of the California Aqueduct within the SWP, located west of Interstate Highway 5 within Kern County in Southern California. The pumping plant with four discharge lines provides the third in a series of lifts culminating at the A.D. Edmonston Pumping Plant to move the water across the Tehachapi Mountains into Southern California.

### Interim Action Plan (2021-2025)

DWR Strategic Plan Goal 4, Objective 3.6: Support California energy agencies in reaching out to public water agencies to reduce electricity usage and increase generation during emergencies on the electric grid.

- Continue to align SWP load and generation with CAISO's grid needs.
- Monitor power market dynamics and evolution of resource mix, initiate and influence needed market design changes, and assess their impacts on SWP.
- Continue outreach to CAISO and other state agencies highlighting the SWP's plans for supporting the grid, and the need for partnerships and outside funding.
- Partner with SWP Contractors to investigate and deploy demand side flexibility.

As more and more renewable energy resources are added to the grid, the need for more flexibility increases. SWP will need to adapt its operations to add more flexibility to the system. Pump load is based on hydrology, so SWP's load demand can have large variations from year to year, making long-term hedging strategies challenging. As California's resource mix continues to change, opportunities or additional roles and responsibilities may arise for DWR, but future investments should not distract from the SWP's core mission of delivering water.


Shasta Lake
Sacramento River
Lake Oroville
Feather River
Oroville Dam River Outlet System Rehabilitation
Oroville Spillway Maintenance Repairs
SWP Fire and Life Safety Modernization
SWP Physical Security Upgrades
Salmonid Habitat Restoration and Fish Passage (Big Notch)
North Bay Aqueduct
Montezuma Slough Radial Gates Refurbishment
Chipps Island Tidal Habitat Restoration Project
South Bay Aqueduct
Gianelli Pumping Generating Plant Unit Refurbishment
San Joaquin River
Dos Amigos Refurbishment
Devil's Den Pumping Plant Electrical Fault Response and Recovery
California Aqueduct
Coastal Branch
Pyramid Spillway Maintenance Repairs
West Branch
East Branch
Cedar Springs Spillway Maintenance Repairs
East Branch Extension
California Aqueduct Radial Gate Maintenance and Repairs

Photo by Florence Low/DWR

The Big Notch Project is located in the Fremont Weir State Wildlife Area in Yolo County. Part of the project includes the removal of a section of the Fremont Weir, the installation of three gates, the excavation of 180,000 cubic yards to carve a new path for salmon, and construction of a control building and pedestrian bridge. Big Notch Project is a 30,000-acre floodplain habitat restoration and fish passage project in the Yolo Bypass.

## Status of SWP Construction Projects

DWR manages the SWP to ensure adequate water supplies are available under various hydrologic and legal conditions while maintaining SWP operational flexibility. Key construction activities undertaken in the past year to manage and maintain the SWP occurred across the entire length of the SWP and include all major facility types – dams, canals, pipelines, and pumping and generating plants. The 12 examples that follow are a sampling of the more than 300 distinct projects and programs that contribute to the no-fail operation of the SWP.

**SWP Fire and Life Safety Modernization:** Implemented in response to the 2012 Thanksgiving Day fire at Thermalito (Robie) Pump-Generating Plant, this program covers fire detection and alarms, fire suppression systems, protected egress routes, HVAC modifications, new domestic and raw water lines, and emergency responder communications. DWR completed work in the Oroville Field Division in 2022. DWR awarded a construction contract for the San Luis Field Division in September 2023. DWR is expected to award a construction contract for the San Joaquin Field Division in February 2024.

**SWP Physical Security Upgrades:** Physical security upgrades at each Field Division include security operations centers, guard shacks, impact-rated gates

Photo by Ken James/DWR

Water being released down the Oroville Dam main spillway at Lake Oroville in Butte County. On June 12, 2023, the water storage was 3,524,311 acre-feet, 100 percent of the total capacity.

and bollards, security fencing and cameras, hardened doors and windows, and key card readers and door contacts. DWR completed work in the Oroville Field Division in 2023. DWR awarded a contract in April for the Delta and San Luis Field Divisions, and will advertise a contract this winter for the San Joaquin and Southern Field Divisions. In 2024, DWR will begin the design process for facilities regulated by the Federal Energy Regulatory Commission in Southern Field Division.

**Salmonid Habitat Restoration and Fish Passage (Big Notch):** The Big Notch project will create critical floodplain habitat for juvenile fish and improve a migration corridor for adult fish, as required by the SWP Biological Opinion and Incidental Take Permit. The project includes an intake channel, headworks structure and control building, transport channel, pedestrian bridge, and an electrical communications connection to the adult fish passage facility. High water slowed work on the project, but DWR has since commenced work, with construction expected to be completed in September 2024.

**Oroville Spillway Maintenance Repairs:** DWR conducts inspections annually to identify maintenance needs at the Oroville Spillway. Due to wet hydrology, the spillway saw significant use in 2023, with more than 2.37 million acre-feet released – roughly 67 percent of the reservoir's capacity. Surveillance and instrumentation data confirmed satisfactory performance of the spillway. DWR awarded a three-year contract to address joint sealant, localized shallow concrete repairs, and to inspect the underdrain system. The concrete repairs total 0.1 percent of the spillway's surface.

Photo courtesy DWR

Cedar Springs Dam and Silverwood Lake, located on the West Fork Mojave River, a tributary of the Mojave River in the San Bernardino Mountains.

**Cedar Springs and Pyramid Spillway Maintenance Repairs:** DWR conducts inspections annually to identify maintenance needs. The last major maintenance occurred in late 2017. In June 2023, DWR contracted for joint sealant and localized shallow concrete repairs at the spillways.

**California Aqueduct Radial Gate Maintenance and Repairs:** Radial gates on the California Aqueduct control the flow between canals and pipelines. Many of the radial gates have been in place for more than 50 years. A conditions assessment on the gates revealed that 10 were beyond refurbishment condition. Ten new gates will be fabricated as part of a contract. Six gates were fabricated and installed in 2022 and 2023, and the remaining four will be in 2024.

**Montezuma Slough Radial Gates Refurbishment:** The Montezuma Slough radial gates refurbishment project includes the repair and recoating of all gate trunnions, fabricating stoplogs for bay isolation during the gate outage, and maintenance and repairs on the gate hoists and gearboxes. All onsite work must occur between August and October of each year due to environmental permitting requirements and is limited to one gate at a time due to operations. DWR has refurbished and reinstalled two gates, with a third expected to be finished by November 2024. In spring of 2023, DWR observed cracks in Bay Wall No. 2, located below the trunnion, leading to concerns that the trunnion tendons may have been exposed to salt water, which may compromise their integrity. A series of inspections revealed no lost tension and showed no signs of damage.

Photo courtesy/DWR

Dos Amigos Pumping Plant is located on the California Aqueduct San Luis Canal in Merced County. The SWP facility lifts water over 100 feet from the aqueduct as it flows south from O'Neill Forebay and just east of Interstate 5.

**Oroville Dam River Valve Outlet System (RVOS) Rehabilitation Project:** Rehabilitation of the RVOS continues with the installation of new spherical valves, removal and replacement of fixed cone valves, and installation of new hydraulic, electrical, ventilation, and seat water system. This is a drought- and safety-critical project, as it allows DWR to safely meet water delivery requirements during periods of low water elevations at Lake Oroville. Currently 60 years old, new spherical valves will allow operation for another 50 to75 years. Phase 1 is complete, with Phase 2 scheduled for completion in fall 2024.

**Gianelli Pumping-Generating Plant Unit Refurbishment:** This project includes the redesign, replacement, and refurbishment of rotating and embedded components to Original Equipment Manufacturer (OEM) design, as components are at the end of their service life. Components include pump-turbine head cover and impeller, packing box and equalizing line, 156-inch butterfly discharge valve, stator cores, and rotor poles. The project is a multi-year effort to refurbish eight units and on schedule to be completed in 2024.

**Dos Amigos Pumping Plant Unit Refurbishment:** This project includes the redesign, replacement, and refurbishment of rotating and embedded components to OEM design, as components are at the end of their service life. Components include blade trolley carts, impeller stands, variable pitch pumps, rotor poles, stator platforms, and automatic voltage regulators. The project is a multi-year effort to complete the six units at Dos Amigos, approximately one unit every two years. The first unit is scheduled for completion in early 2025.

Photo courtesy DWR

Part of the Coastal Branch Aqueduct in Kern County, Devil's Den Pumping Plant was built underground and has a small forebay to regulate water deliveries. The plant was constructed between 1994 and 1996 as part of the Coastal Branch Aqueduct, Phase II.

**Devils Den Pumping Plant Electrical Fault Response and Recovery:** In August 2023, the Devil's Den Pumping Plant facility suffered an electrical fault causing an arc-flash that destroyed the cubicle from Unit 1, all its contents, and a section of 4160V bus. Heat, pressure, and smoke from the blast damaged the entire 4160V switchgear lineup with cubicles for motor Units 1-6, 480V station service, 70kV breaker and power transformer controls. Units 4, 5, and 6 were returned to service to make water deliveries. Units 1-3 will need to be redesigned and equipment procured before they are back in service.

**Chipps Island Tidal Habitat Restoration Project:** This project was implemented to restore the diked managed wetland back to tidal wetlands, and includes vegetation management on the exterior levee and interior island. The project is expected to be completed in November 2025.

## Conclusion

This document fulfills the Commission's requirement to review the progress of the construction and operation of the SWP. The Commission has determined that DWR is working to maintain the operations of the SWP, preparing for and responding to climate extremes, and maintaining operational flexibility so that the SWP continues to benefit California. The Commission requests that DWR continue to keep the Commission apprised of operations and construction activities in 2024. These findings and recommendations will be presented to DWR and the Legislature.

California
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