SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

AGENDA

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
380 E. Vanderbilt Way, San Bernardino, CA 92408

REGULAR MEETING OF THE BOARD OF DIRECTORS
2:00 PM Tuesday, August 18, 2026

ZOOM INFORMATION
Online: https://sbvmwd.zoom/us/j/83910934313
Telephone: (877) 853-5247 US Toll-free

Meeting ID: 839 1093 4313
PASSCODE: 3802026

If you are unable to participate online or by telephone, you may submit your comments and questions in writing for Board consideration by emailing comments@sbvmwd.com with the subject line Public Comment Item # (insert the agenda item number relevant to your comment) or Public Comment Non-Agenda Item. Submit your written comments no later than 6 p.m. the day prior to the meeting. All public comments will be provided to the Board President and may be read into the record or compiled as part of the record.

IMPORTANT PRIVACY NOTE: Online participants MUST log in with a Zoom account. The Zoom app is a free download. Please keep in mind: (1) This is a public meeting; as such, the virtual meeting information is published on the World Wide Web and available to everyone. (2) Should you participate remotely via telephone, your telephone number will be your identifier during the meeting and available to all meeting participants; there is no way to protect your privacy if you elect to call in to the meeting.

CALL TO ORDER/PLEDGE OF ALLEGIANCE/ROLL CALL

1) PUBLIC COMMENT
Members of the public may address the Board regarding any item within the subject matter jurisdiction of the Board; however, no action may be taken on off-agenda items except as authorized by law. Each speaker is limited to a maximum of three (3) minutes.

2) CONSENT CALENDAR

2.1 Approve Minutes of the Regular Board of Directors' Meeting - May 19, 2026 (2 min) - Page 4
Approve Minutes of the Regular Board of Directors' Meeting - May 19, 2026

3) DISCUSSION AND POSSIBLE ACTION ITEMS

3.1 Consider Non-Binding Memorandum of Intent with Antelope Valley Water Storage LLC for Potential Participation in the Willow Springs Water Bank (20 min) - Page 12
Staff Memo - Consider Non-Binding Memorandum of Intent with Antelope Valley Water Storage, LLC for Potential Participation in the Willow Springs Water Bank
1. MOI Willow Springs Water Bank MOI

3.2 Consider an Agreement with University of California San Diego for Final Viability Assessment of Forecast Informed Reservoir Operations at Seven Oaks Dam (20 min) - Page 24
Staff Memo - Consider an Agreement with University of California San Diego for Final Viability Assessment of Forecast Informed Reservoir Operations at Seven Oaks Dam
1. Seven Oaks Dam FIRO Preliminary Viability Assessment - July 2026
2. Scripps FIRO FVA Proposal

3.3 Consider Establishment of a Standing Committee for Personnel/ Workforce Development , as Requested by the Board for a Future Business Item

4) <u>REPORTS (Discussion and Possible Action)</u>

4.1 Directors' Report of Activities and Travel Requests in accordance with Resolution 1100(10 min) - Pg.128
SBVMWD Director Fees and Expenses paid in July 2026
Director Botello Activity Report - July
Director Kielhold Activity Report - July
Director Longville Activity Report - July
Director Harrison Activity Report - July
Director Velasquez Activity Report - July

4.2 General Counsel Report

4.3 SAWPA Meeting Report

4.4 Treasurer's Report (2 min) - Page 134
Treasurer's Report - July 2026

4.5 Water Delivery Report (10 min) - Page 143
July 2026 - Water Delivery Report
July 2026 - Water Delivery Report Summary

4.6 CEO/General Manager's Report(20 min) - Page 147
Staff Memo - August General Manager's Report
1. August Project Status Update
2. August - 3 Month Look Ahead

5) **<u>FUTURE BUSINESS</u>**

6) **<u>ANNOUNCEMENTS</u>**

6.1 List of Announcements (2 min) - Page 164
List of Announcements

7) <u>CLOSED SESSION</u>

8) ADJOURNMENT

MINUTES
OF
THE
REGULAR BOARD MEETING
SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

May 19, 2026

Directors Present: Gil J. Botello, T. Milford Harrison, Paul R. Kielhold, Susan Longville, and Jose Velasquez

Directors Absent: None

Staff Present:
Heather Dyer, MS, MBA – Chief Executive Officer/General Manager
Wen Huang, PE, MS – Chief Operating Officer/Assistant General Manager
Jose Macedo, ML, CPT-P (USA Retired) – Chief of Staff/Clerk of the Board
Michael Plinski, PE – Chief of Water Resources
Cindy Saks, CPA – Chief Financial Officer/Deputy General Manager

Owen Cross – Intern
Anthony Flordelis – Business Systems Analyst
Greg Herzog – Principal Water Resources Analyst
Adekunle Ojo – Manager of Integrative Planning
Matthew Olivo – Senior Accountant
Sayer Pinto, MBA – Principal Water Resources Analyst
Karen Resendez, MAOL – Human Resources & Risk Manager
Alliah Smith – Senior Administrative Assistant
Francisco Wences – Assistant Engineer

Brad Neufeld, Varner & Brandt
Meredith Nikkel, Downey Brand
Sam Bivins, Downey Brand

Members of the Public in Attendance:
John Monsen, Sierra Club
John Longville, San Bernardino Valley Water Conservation District
Duncan MacEwan
Richard Howitt
James Morales, East Valley Water District
Melody McDonald, San Bernardino Valley Water Conservation District
Larry Smith, San Gorgonio Pass Water Agency
Joe Zoba, Yucaipa Valley Water District
Allison Edmisten, Yucaipa Valley Water District
Justin Castruita, Fontana Water Company
Tiffany Tint, PFM Asset Management

Mark Iverson, Western Heights Water Company
Benjamin Kelly, Western Heights Water Company
Madeline Blua, Blua Consulting
Courtney Hamilton, CV Strategies
Charles Vahovick

The regular meeting of the Board of Directors was called to order by President Harrison at 2:00 p.m. President Harrison led the Pledge of Allegiance. A quorum was noted present by roll call.

Agenda Item 1. Public Comment. None.

Agenda Item 2. Consent Calendar.

2.1) Approve Minutes of the Regular Board of Directors Meeting – April 7, 2026

2.2) Approve Minutes of the Board of Directors Special Meeting – Resources / Engineering Workshop – April 14, 2026

2.3) Approve Minutes of the Regular Board of Directors Meeting – April 21, 2026

The Board of Directors approved the items on the Consent Calendar by the following roll-call vote:

MOVED: Longville	SECONDED: Botello	APPROVED 5-0
AYES:	Botello, Harrison, Kielhold, Longville, Velasquez	
NOES:	None	
ABSTAIN:	None	
ABSENT:	None	

Agenda Item 3. Discussion and Possible Action Items

3.1) Consider Authorizing up to $250,000 to Western Heights Water Company in support of Yucaipa Basin Groundwater Investigations, Groundwater Modeling, and Related Activities Towards Implementation of the Aquifer Storage and Recovery Program. Chief of Water Resources Michael Plinski and Principal Water Resources Analyst Greg Herzog presented an overview of Western Heights Water Company's proposed Aquifer Storage and Recovery (ASR) Program. The presentation described the Western Heights Water Company (WHWC) service area, existing groundwater production and State Water Project supplies, and the partnership with Yucaipa Valley Water District (YVWD) to develop an ASR program utilizing treated State Water Project water for underground storage within the Yucaipa Basin. The proposed program would inject treated water into two repurposed wells for seasonal storage and later extraction, providing greater water supply flexibility, resiliency, and groundwater management benefits. Vice President Botello noted the project could provide additional flexibility in managing State Water Project supplies while supporting long-term groundwater sustainability and regional water supply reliability.

Staff outlined the project's feasibility evaluation, explaining that groundwater modeling and water quality analyses had been completed using an integrated Yucaipa Basin model to characterize project conditions. The presentation indicated that modeling results anticipated negligible effects on existing nitrate and 1,2,3-trichloropropane (1,2,3 -TCP) plumes and supported proceeding with a pilot injection test. Staff reviewed the scope of work for the pilot phase, including continued groundwater modeling, permitting, baseline data collection, and evaluation of aquifer conditions prior to consideration of a full-scale ASR program. Director Kielhold expressed support for the regional partnership between Western Heights Water Company, Yucaipa Valley Water District, and San Bernardino Valley and noted the value of advancing additional groundwater storage opportunities within the Yucaipa Basin. He also requested that an agreement be developed to memorialize the terms and expectations of this project partnership.

Staff concluded with an overview of the project's path forward, including advancement of Regional Board authorization for the pilot study, completion of environmental documentation, construction of supporting facilities, implementation of a two-year pilot program, and future development of a full-scale ASR program capable of injecting approximately 400 to 500 acre-feet of treated State Water Project water annually. The presentation also highlighted the regional partnerships supporting the effort and explained that WHWC had requested up to $250,000 from San Bernardino Valley to fund groundwater modeling and related investigations that would advance the project and expand technical understanding of groundwater conditions within the Yucaipa Basin.

> The Board of Directors authorized up to $250,000 to Western Heights Water Company for funding of Yucaipa Basin groundwater investigations, groundwater modeling, and related activities towards implementation of WHWC’s aquifer storage and recovery program by the following roll-call vote:

MOVED: Kielhold	SECONDED: Botello	APPROVED: 5-0
AYES:	Botello, Harrison, Kielhold, Longville, Velasquez	
NOES:	None	
ABSTAIN:	None	
ABSENT:	None	

3.2) Quarterly Investment Portfolio Update with PFM Asset Management. Tiffany Tint, Senior Relationship Manager from PFM Asset Management, reviewed the quarterly investment portfolio activity. Ms. Tint reported on current economic conditions in relationship to the District’s investment portfolio. Director Velasquez thanked PFM Asset

Management for the update and expressed appreciation for the District’s continued emphasis on prudent investment practice.

3.3) Summary Review of the Public Drafts of the 2025 Regional Urban Water Management Plan and Water Shortage Contingency Plan. Manager of Integrative Planning Adekunle Ojo and Chief of Water Resources Michael Plinski presented an overview of the draft 2025 Regional Urban Water Management Plan (UWMP) and Water Shortage Contingency Plan (WSCP). Staff explained that the plans were prepared through a collaborative regional effort involving San Bernardino Valley and participating retail agencies to satisfy California Water Code requirements for urban water suppliers. The presentation reviewed the organization of the Regional UWMP, including the regional context, agency-specific chapters, supporting information, and Water Shortage Contingency Plan.

Staff summarized the water supply reliability analysis through the 2050 planning horizon under normal, single dry-year, and five consecutive dry-year conditions. The presentation indicated that the region's available water supplies, together with coordinated groundwater recharge, storage, and imported water management strategies, are projected to meet anticipated demands through the planning horizon. Staff also highlighted existing and planned water supply reliability projects, continued investment in regional water supply diversification, and ongoing demand management and water conservation efforts in partnership with retail agencies. Director Kielhold commented positively on the region’s projected ability to meet demands through 2050 under normal and dry-year conditions and emphasized the importance of continued investment in groundwater recharge, storage, conservation, and diversified water supplies.

In discussing demand management measures, staff noted that investments in water efficiency and conservation programs have meaningfully reduced per-capita demand. San Bernardino Valley’s Demand Management Program has focused on assisting retail agencies with funding and technical assistance to help them meet their upcoming state water efficiency standards.

Staff concluded with an overview of the Water Shortage Contingency Plan, including the annual water supply and demand assessment process, water shortage stages, shortage response actions, communication protocols, and emergency planning for catastrophic water supply interruptions. The presentation concluded that the region maintains long-term water service reliability under normal and drought conditions through continued collaborative planning, resource development, and implementation of regional water reliability projects. President Harrison noted that the Water Shortage Contingency Plan provides an important framework for coordinated regional response during drought and other water supply emergencies.

Staff requested Board feedback on the draft plan prior to the scheduled public hearing and adoption on June 2, 2026.

Agenda Item 4. Reports. (Discussion and Possible Action)

4.1) Directors' Report of Activities and Travel Requests in accordance with Resolution 1100.

Director Longville reported that she attended:

- Apr. 2 – Basin Technical Advisory Committee
- Apr. 13 – The Climate Center Policy Summit
- Apr. 18 – Earth Day event – Redlands
- Apr. 22-24 State Water Project tour

Director Botello reported that he attended:

- Apr. 1 – California Conservation Corps Salmon Restoration project
- Apr. 8 – California Natural Resources Agency: A New Way to Capture Water With a Hotter/Drier Climate
- Apr. 13 – State Water Project meeting
- Apr. 15 – Webinar with Senator Padilla
- Apr. 17 – Presentation by California Natural Resources Secretary Wade Crowfoot

President Harrison reported that he attended:

- Apr. 3 – Redlands Chamber of Commerce
- Apr. 7 – California Special Districts Association (CSDA) Legislative conference
- Apr. 13 – Association of San Bernardino County Special Districts meeting
- Apr. 20 – Association of San Bernardino County Special Districts meeting
- Apr. 23 – National HCP Annual Conference
- Apr. 28 – Highland Chamber of Commerce meeting

Director Velasquez reported that he attended:

- Apr. 6 – Basin Technical Advisory Committee
- Apr. 4 – City of Colton Earth Day event
- Apr. 20 – Association of San Bernardino County Special Districts meeting
- Apr. 28 – Metropolitan Water District Subcommittee on Imported Water

Director Kielhold reported that he attended:

- Apr. 1 – Beaumont Basin Watermaster meeting
- Apr. 8 – San Bernardino Valley Water Conservation District meeting
- Apr. 15 - San Bernardino Valley Conservation Trust

4.2) General Counsel Report. None.

4.3) Ad-Hoc and Standing Committee Reports. None.

4.4) SAWPA Meeting Report. Director Botello presented the SAWPA Commission May 19, 2026 Regular Meeting and Strategic Planning Workshop report:

- The Commission participated in the Strategic Planning Workshop facilitated by Catalyst Group, during which it provided input on identifying key elements and concepts for SAWPA's Vision, Mission, and Values.

4.5) Treasurer's Report. Director Longville presented the April 2026 report:

The Board approved the following cash disbursements for the month of April 2026:

State Water Contract Fund	$ 2,748,904.00
General Fund	$ 5,220,886.30

MOVED: Velasquez	SECONDED: Botello	APPROVED: 5-0
AYES:	Botello, Harrison, Kielhold, Longville, Velasquez	
NOES:	None	
ABSTAIN:	None	
ABSENT:	None	

4.6) Water Delivery Report. Principal Water Resources Analyst Sayer Pinto reported the following for the month of April 2026:

April 2026	acre-feet (af)
Imported State Project Water delivered to the District	1,703
Baseline Feeder Wells	462
Santa Ana River diversions	2,445
Direct deliveries April 2026 (the operating plan is 20,530)	4,995
Recharge deliveries (32 percent of plan)	704

Ms. Pinto reported:

- As of May 18, 2026, the San Bernardino 3-Station Precipitation Index has measured 35.29 inches (4.23 inches above historic average)
- The Northern Sierra 8-Station Index will need to measure 3.8 inches of additional precipitation to reach the Water Year average of 53.2 inches.
- The State Water Project allocation has been increased to 45% (46,170 af to SBV). SBV will be able to fill all direct delivery orders; retailers have been notified.
- Recharge efforts are still largely on hold
- Water Resources staff are monitoring state reservoir levels and weather patterns to stay ahead of potential El Niño climate conditions

4.7) CEO/General Manager's Report. CEO / General Manager Heather Dyer presented her report, which included updates on:

- The 2026 Rialto Decree Advisory Letter, including the annual spring-high groundwater elevation measurements and resulting extraction reduction under the decree.
- Progress on the County Line Road Recharge Project, including completion of cast-in-place pipe rehabilitation and the anticipated December 2026 project completion.
- Recent engagement activities, including the State Water Project Tour, Girls on the Run educational outreach, Foothill Pump Station tour, and participation in the California Water Plan Advisory Committee kickoff.
- Upcoming CEO/General Manager and staff speaking engagements.
- Employee updates, including the hiring of James Law as Project Manager II – Land Management.
- Agency project updates

President Harrison commended staff for the District's recent educational outreach, tours, and regional engagement activities.

Agenda Item 5. Future Business. None.

Agenda Item 6. Announcements.

6.1) List of Announcements. Chief of Staff/Clerk of the Board Jose Macedo reviewed the List of Announcements.

Agenda Item 7. Closed Session. District Counsel Brad Neufeld announced the Closed Session. President Harrison opened the Closed Session at 3:40 p.m.

7.1 Conference with Legal Counsel – Anticipated Litigation
Significant exposure to litigation pursuant to paragraph (2) of subdivision (d) of Government Code section 54956.9
(one potential case)

President Harrison returned the meeting to Open Session at 4:47 p.m. Counsel Brad Neufeld announced that no reportable action was taken.

Agenda Item 8. Adjournment. President Harrison adjourned the meeting at 4:49 p.m.

APPROVAL CERTIFICATION

I hereby certify to approval of the foregoing minutes of the San Bernardino Valley Municipal Water District

Secretary

Date

Respectfully submitted,

Lynda J. Kerney
Contract Assistant

SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

DATE: August 18, 2026

TO: Board of Directors

FROM: Michael Plinski, Chief of Water Resources
Francisco Wences, Assistant Engineer

SUBJECT: Consider Non-Binding Memorandum of Intent with Antelope Valley Water Storage, LLC for Potential Participation in the Willow Springs Water Bank

Staff Recommendation

Authorize the CEO/General Manager to execute the non-binding Memorandum of Intent (MOI) with Antelope Valley Water Storage, LLC for potential participation in the Willow Springs Water Bank Conjunctive Use Project.

Summary

Antelope Valley Water Storage, LLC (AVWS), a private company, is developing the Willow Springs Water Bank Conjunctive Use Project, a large-scale groundwater banking project in the Antelope Valley. This Project is intended to provide participating State Water Project (SWP) contractors with the capacity to deliver water into the water bank, store it underground, and later recover and deliver stored water back to the SWP system to strengthen regional water supply reliability. AVWS has invited San Bernardino Valley and other SWP contractors to participate in the project and has provided a Memorandum of Intent (MOI) to identify interested agencies and their anticipated storage and delivery/storage capacities as the project advances.

The MOI is non-binding and would signal San Bernardino Valley's interest in continued evaluation of the Project. It also establishes a shared understanding of the project's scope, schedule, and framework for allocating project benefits. Based on the preliminary planning, San Bernardino Valley would target approximately 50,000 acre-feet of storage capacity and 12,500 acre-feet of annual put/take (delivery and recovery) capacity.

Executing the MOI does not commit the District to fund or participate in the Project. Any future financial commitment or binding participation agreement would be brought to the Board for consideration.

Participation in the Willow Springs Water Bank could strengthen the reliability of San Bernardino Valley's SWP supplies by providing the District with the ability to store SWP water when it is available in wet years and recover it during dry years when SWP allocations may be reduced.

The project is currently in its initial development phase (Phase 1A). AVWS is seeking SWP contractors and other public agencies that may be interested in future storage opportunities. Executing the MOI would preserve San Bernardino Valley's opportunity to participate in the Project and provide the District an opportunity to help shape the Project terms as development proceeds, while preserving the Board's authority over any future binding commitment.

The MOI has been reviewed and approved as to form by the District special counsel, Downey Brand.

<u>Background</u>

AVWS has acquired and is developing approximately 1,870 acres for the Willow Springs Water Bank Conjunctive Use Project in the Neenach Sub-basin of the Antelope Valley Groundwater Basin, located in the northwest part of the Antelope Valley in Kern County, California. The Project would integrate the SWP system with groundwater storage, allowing participating agencies to convey SWP water into storage and later recover it when needed. As currently planned, the Project would provide up to 1,000,000 acre-feet of storage capacity, up to 250,000 acre-feet per year of delivery capacity, and up to 225,000 acre-feet per year of recovery and return capacity.

AVWS holds the Project rights necessary to convey, store, recover, and transfer SWP water. Participating agencies would retain ownership and control of their respective SWP Table A amounts or other eligible water supply entitlements.

The Project is being developed in phases and is currently in Phase 1A, a feasibility confirmation phase. This phase includes entitlements, California Environmental Quality Act (CEQA) approvals, turn-in and turn-out agreements with California Department of Water Resources (DWR), completion of groundwater modeling, and a storage agreement with the Antelope Valley Watermaster. If demonstrated to be feasible, phase 1B would cover engineering design, permitting, and preconstruction activities. Phase 2, if pursued, would include construction of the Project facilities and connections to the SWP.

The Project was conditionally awarded up to $128,274,876 in grant funding through California's Proposition 1. To fund later phases, AVWS anticipates seeking participating agencies to share proportionately in the permitting, design, and construction costs, as well as in public-benefit obligations for “pulse flows” and other requirements associated with the Proposition 1 funding.

Execution of the MOI would position San Bernardino Valley to continue evaluating the project and potentially participate in those future phases. Any proposed cost-sharing arrangement or other binding commitment would be presented to the Board for separate consideration.

District Strategic Plan Application

This item is consistent with San Bernardino Valley’s objective to work collaboratively to proactively manage a diverse, adaptable water supply portfolio to maximize the value of the region’s water assets.

Fiscal Impact

There is no fiscal impact associated with executing the non-binding MOI. The MOI does not commit the District to provide funding or enter into the Project. Any future financial commitment associated with participation in the Willow Springs Water Bank, including participation in Phase 1B or subsequent project phases, would be presented to the Board for consideration under a separate agreement.

Attachment

1. Non-Binding Memorandum of Intent between Antelope Valley Water Storage and San Bernardino Valley Municipal Water District for the Willow Springs Water Bank Conjunctive Use Project

Willow Springs Water Bank

MEMORANDUM OF INTEREST
(Willow Springs Water Bank)

This MEMORANDUM OF INTEREST (this "**MOI**") is made and entered into this __ day of ______, 2025 (the "**Effective Date**") by and between ANTELOPE VALLEY WATER STORAGE, LLC, a Delaware limited liability company **("AVWS")**, on one hand, and ____________________, a _________________ ("**Interested Party**"), on the other hand.

RECITALS

A. AVWS has acquired and is developing approximately 1,870 acres for the Willow Springs Water Bank Conjunctive Use Project (the "**Project**") in the Neenach sub-basin of the Antelope Valley Groundwater Basin, situated in the northwest part of the Antelope Valley in Kern County, California. The Project is proposed as a conjunctive use and reservoir reoperation project that would integrate the State Water Project reservoir and conveyance system with south-of-Delta groundwater storage. The Project includes the development and operation of infrastructure including necessary pipelines, pump stations, power transmission lines, and other facilities needed to provide new water supply and storage.

B. The Project is currently planned to provide (i) up to 1,000,000 Acre Feet of Storage Capacity, (ii) up to 250,000 Acre Feet per year of Delivery Capacity, and (iii) up to 225,000 Acre Feet per year of Recovery and Return Capacity.

C. The Project is being developed in Phases:

Phase 1A (in progress) – Feasibility Confirmation: entitlements/CEQA approvals; completion of groundwater modeling and storage agreement with the Antelope Valley Watermaster;

Phase 1B – Design Development and Preconstruction: completion of entitlements, permitting, design development and preconstruction;

Phase 2 – Construction Phase: construction and commissioning of pipelines and connections to the State Water Project, well field & percolation ponds, power, and pump stations

D. The Project has been conditionally awarded up to $128,274,876 of grant funding through California's Proposition 1, Water Quality, Supply, and Infrastructure Improvement Act of 2014 (California Water Code Section 79700, et. seq.) ("**Prop 1**"). The Project has been allocated up to $6,413,744 in early funding from its Prop 1 grant funds to pay for eligible Project Costs pursuant to funding agreements between the California Water Commission and the Southern California Water Bank Authority.

E. In order to fund Project Costs for Phase 1B and beyond, AVWS is looking for State Water Project ("**SWP**") water contractors, municipal entities and other public agencies that will pay to participate in and receive benefits from the Project and share pro rata in providing the public benefits required in order to obtain Prop 1 funding for the Project ("**Participants**").

F. The Interested Party executing this MOI has expressed an interest in becoming a Participant in exchange for receiving a commitment from AVWS to provide Storage Capacity, Delivery Capacity and Recovery and Return Capacity in the Project. At the time of this MOI's execution, the Interested Party is exploring the acquisition of up to 50,000 acre-feet of Storage Capacity in the Project. The extent of the Interested Party's participation in the Project is subject to change based on a variety of factors, including but not limited to the needs of the Interested Party, the development of the Project, and negotiations between Interested Party and AVWS.

G. In connection with Phase 1B, AVWS will seek to enter into one or more groundwater banking agreements (the "**Contract**") with Interested Party and other Participants setting forth the Storage Capacity, Delivery Capacity and Recovery and Return Capacity allocated to each Participant and the commitment of Participants to provide funding to the Project. For avoidance of doubt, this MOI does not make Interested Party a Participant or commit Interested Party to provide any funding for the Project unless and until AVWS and Interested Party execute a Contract.

H. The purpose of this MOI is to establish the guiding principles and preliminary terms to assist in the development of the Contract between AVWS and the Interested Party (AVWS and the Interested Party being sometimes collectively referred to herein as the "**Parties**" and individually, as a "**Party**").

I. The Parties acknowledge and agree that they are not committing to or approving any course of action in this MOI, and that nothing in this MOI is intended to be a pre-decisional commitment of funds or resources by any Party.

AGREEMENT

NOW THEREFORE, for good and valuable consideration, the Parties agree as follows:

1. **Purpose of this MOI.** While details still need to be finalized for a full and complete Contract to be reached, the Parties believe this document represents their mutual understanding of the bases for the Contract's allocation of Project benefits, costs, risks and development obligations. The Parties agree to take this MOI to their agency management and governing bodies to receive their feedback and input and then will work cooperatively and in good faith to consider the feedback and input and work to resolve issues identified and to negotiate in good faith to establish a Contract. Except for the provisions of Paragraphs 1, 2 and 10 of this MOI, which shall be binding on the Parties, nothing in this MOI shall be binding upon the Parties.

2. **Term; Renewal**. The term of this MOI shall commence upon the Effective Date and shall continue until the earlier to occur of (a) the first anniversary of the Effective Date, and (b) the execution of a Contract between AVWS and Interested Party. If a Contract has not been executed by the expiration of the then current term, the term of this MOI shall continue on a year-to-year basis. Notwithstanding the foregoing, either AVWS or Interested Party may elect in their sole discretion to discontinue negotiation of a Contract and terminate this MOI at any time upon notice to the other Party.

3. **Definitions**. In addition to the terms defined elsewhere in this MOI, as used in this MOI, the meaning of the terms hereinafter set forth shall be as follows:

"Delivery Capacity" means the capability of the WSWB Facility to accept, convey, and place into storage, either directly or through in lieu means, water delivered to the facility, such capability being measured as an annual quantity in acre feet.

"Delivery Fee" means the charge that a Participant pays for each acre foot of water that the Participant delivers for storage in the WSWB Facility.

"**First Priority Right**" means the first right of each Participant, on an instantaneous and annual basis, to use the specified Delivery, Storage, or Recovery and Return Capacities, which right is held in common with other Participants.

"**Initial Contribution**" means the initial contribution of each Participant towards Project Costs to be made upon the execution of the Contract.

"**Management Fee**" means the management and maintenance charges payable to AVWS or its designee, by each Participant for the management, maintenance and repair of the Project.

"**Partner Facilities**" means pipelines and other facilities owned and operated by other entities that are necessary for Participants to access benefits from the Project.

"**Project Costs**" means all hard and soft costs of entitling, designing, permitting and constructing the Project as shown on the Budget, as the same may be updated from time to time.

"**Project Water Right**" means AVWS's right to convey, store, recover, and transfer SWP water provided by Project Participants, but does not include any entitlement to SWP water held by a Project Participant.

"**Recovery Fee**" means the charge that a Participant pays for each acre foot of Water a Participant recovers from storage at the WSWB Facility.

"**Recovery and Return Capacity**" means the capability of the WSWB Facility to remove previously stored water from storage and to convey it to the point of return, measured as an annual quantity of acre feet.

"**Storage Capacity**" means the capability of the WSWB Facility to store water in a groundwater basin for purposes of subsequent removal and transport to a place where it will be beneficially used, measured in acre feet.

"WSWB Facility" means the Willow Springs Water Bank.

4. <u>Public Benefit Agreements</u>. Interested Party acknowledges that AVWS intends to enter into agreements for the administration of public benefits from the Project with various agencies of the State of California as required by the terms of Prop 1, including the California Department of Fish and Wildlife for pulse flows on the Feather River, and the Department of Water Resources for emergency response benefits. While these state agencies are not Participants and will not be party to a Contract, they have crucial roles in administering public benefits and in coordinating Project operations. Through future agreements between the AVWS and/or Participants and these State of California agencies, Participants will participate pro rata in these public benefits based on their allocation of Storage Capacity.

5. <u>Entitlement, Design and Construction</u>. As the developer of the Project, AVWS is solely responsible for obtaining all entitlements for the Project, securing the Project site and any required property rights, acting as, or coordinating with, the lead agency with regard to complying with CEQA requirements for the Project, obtaining Project permits, evaluating funding options, obtaining necessary financing for Project capital costs, collecting funds for administration and payment of financing costs, payment of Project capital costs during construction (including debt service and reserves), entering into agreements needed to support development of the Project, and overseeing Project design and construction. AVWS shall design and construct the Project as necessary to convey water from the State Water Project to the WSWB Facility and sufficient facilities to convey water from the WSWB Facility to the agreed upon point of return for each Participant. Subject to the Contributions to be made by each Participant and receipt of Prop 1 funds, all costs and expenses to provide sufficient facilities to meet its obligations under the Contract shall be the responsibility of AVWS.

5.1 <u>Project Schedule</u>. The current Project schedule is attached to this MOI as **Exhibit A**. AVWS will provide Interested Party with updated schedules at least every six months showing the progress of each Phase of development of the Project and anticipated milestones for the Project.

5.2 <u>Project Budget</u>. The current Project budget is attached to this MOI as **Exhibit B**. AVWS will be responsible for updating the Budget. Interested Party will be provided with an updated Budget on an annual basis.

5.3 <u>Phase 1A: Status of Conveyance and Turnout Facilities</u>. AB-52 and CEQA consultation for the originally proposed alignment of the Project has been completed, but AVWS will need to file an addendum due to re-routing necessary to avoid Joshua trees. AB-52 and CEQA consultation for AVEK's west feeder alignment need to be completed, but all necessary easements are in place. Turn-in/turn-out connections to the State Water Project for the expanded Project are in progress, but AVWS may require support and or cooperation from Interested Party to obtain such connections.

6. **Participants**. Participants will have no oversight responsibilities or authority relating to the entitlement, permitting, design and/or construction of the Project. Participants are responsible for using their individual authority (authority to establish and collect taxes, taxing authority, etc.) to ensure reliable cashflow to the Project for the timely payment of Project costs (other than costs covered by Prop 1 and other grants, agreements for the administration of public benefits or Project financing obtained by AVWS). In consideration of the contributions to be made by each Participant towards Project Costs, a Participant shall be granted a First Priority Right to its allocation of Storage Capacity, Delivery Capacity and Recovery and Return Capacity. Participants shall cooperate with AVWS in satisfying public benefits and other Prop 1 requirements that are applicable to Participant. Interested Party acknowledges that following the completion of Phase 1A, additional Prop 1 funds may not be available to the Project until the completion of Phase 1B and that funding for Phase 1B may be required from Participants. Interested Party further acknowledges that the storage agreement to be negotiated with the Antelope Valley Watermaster may affect AVWS' ability to operate the Project as currently planned, but that AVWS intends to obtain such storage agreement prior to commencing Phase 1B.

7. **Project Assets and Ownership**. Project infrastructure including the land on which Project facilities are located and physical features of the Project (other than Partner Facilities) will be owned by AVWS. The Project Water Right will be owned by AVWS. A Participant's First Priority Right to its allocation Storage Capacity, Delivery Capacity and Recovery and Return Capacity will be owned by the Participant.

8. **Payments by Participants**.

8.1 Cost Allocation Framework. The costs and fees under the Contract are anticipated to include an Initial Contribution to be funded by each Participant, and Delivery Fees, Management Fees and Recovery Fees once the Project is operational. The Contract will reflect a cost allocation and fee framework to account for which Participants use which WSWB Facilities and Partner Facilities, with input from the Participants. The cost allocation framework will also account for use of the Project and Partner Facilities by State of California Agencies. In no event shall any Initial Contribution of any Participant become payable until the Participant enters into a Contract.

8.2 Project Costs. Project Costs include actual costs of Project development (i.e., land, Water Right, permits, mitigation), design, construction, debt service, operation and maintenance, major renewals and replacements, and administrative costs. Project development costs to date have been funded by the early release of Prop 1 funds pursuant the Funding Agreement and equity from AVWS and its affiliates.

8.3 Costs of Partner Facilities. The Parties recognize that certain Partner Facilities may be needed to realize Project benefits but that not all Participants need to use all the Partner Facilities. Partner Facility costs will be allocated to Participants based on actual use and wheeling rates established in the respective use agreements for the Partner Facilities.

9. **Division of Risk Responsibilities**.

9.1 Risk Mitigation. AVWS and each Participant will agree to cooperate in reducing, to the greatest extent practicable, the risk from claims arising against either of the Parties from implementation of the Contract.

9.2 Indemnity. The Parties will negotiate a reasonable indemnity provision in the Contract, provided that a Party that submits a defense under the Contract's indemnity provision will retain its choice of counsel. **10.** **Miscellaneous.**

10.1 Good Faith Dealings. The Parties agree that they shall each negotiate in good faith and diligently carryout their obligations, within the time required, under this MOI.

10.2 Preparation of Contract. AVWS shall prepare and submit a draft of the Contract and related documents to Interested Party. The draft Contract will incorporate the material terms contemplated by this MOI and the exhibits attached hereto. Thereafter, the Interested Party shall diligently review the draft Contract and consult with AVWS in a good faith effort to arrive at a Contract having a mutually agreeable form and content which may be submitted to the management/governing bodies of the respective parties for approval and execution.

Notwithstanding anything set forth in this Paragraph, neither AVWS nor Interested Party will be required to execute a Contract under this MOI.

10.3 Project Updates. While this MOI is in effect, AVWS shall provide regular updates to the Interested Party regarding the status of the Project, including updates to the Project schedule and Project Budget. AVWS will be available to answer any questions Interested Party may have regarding the Project.

10.4 Mutual Cooperation. The Parties agree to cooperate with one another and their consultants and to supply information in the possession or control of the Party that may be reasonably necessary for the other Party to complete their obligations under this MOI.

10.5 Disclosures. Interested Party understands that AVWS may disclose Interested Party's interest in the Project and indicative amounts of Storage Capacity, Delivery Capacity and Recovery and Return Capacity to governmental and private parties as necessary to progress the Project.

10.6 Further Assurances. In addition to the acts and deeds recited herein and contemplated to be performed, executed and/or delivered by any Party, each Party agrees to perform, execute and deliver, but without any obligation to incur any additional liability or expense except as otherwise provided herein, any further deliveries and assurances as may be reasonably necessary to consummate the transactions contemplated hereby.

10.7 Not a Partnership or Agent. Nothing in this MOI is intended to or shall be construed to establish a currently existing limited liability company, partnership, joint venture, business association, or other entity between the parties, nor to constitute any Party the agent of any other Party.

10.8 Limitation of Liability. Notwithstanding anything in this MOI to the contrary, none of the owners, shareholders, employees, members, or partners of AVWS or of any of its affiliated entities, shall have any personal liability with respect to the duties and obligations of AVWS under this MOI. Notwithstanding anything in this MOI to the contrary, none of the board members, owners, shareholders, employees, members, or partners of Interested Party or of any of its affiliated entities, shall have any personal liability with respect to the duties and obligations of a Interested Party under this MOI.

10.9 Notices. All notices required or permitted hereunder shall be in writing and shall be served on the Parties at the address set forth below. Any such notices shall be either (a) sent by overnight delivery using a nationally recognized overnight courier, in which case notice shall be deemed delivered one (1) business day after deposit with such courier, (b) sent by email, in which case notice shall be deemed delivered upon receipt, or (c) sent by personal delivery, in which case notice shall be deemed delivered upon receipt. Any notice received on other than a business day, or after 5:00 p.m. on a business day in the recipient's state shall be deemed received on the next business day. A Party's address may be changed by written notice to the other Party; provided, however, that no notice of a change of address shall be effective until actual receipt of such notice. Notices given by counsel to a Party shall be deemed given by such Party.

If to AVWS:	Antelope Valley Water Storage, LLC 4700 Wilshire Boulevard Los Angeles, CA 90010 Attention: Anjanette Shadley Email: ashadley@cimgroup.com
with a copy to:	c/o CIM Group, LP 4700 Wilshire Boulevard Los Angeles, CA 90010 Attention: General Counsel Email: generalcounsel@cimgroup.com
If to an Interested Party	________________________ ________________________ ________________________ Attention: ________________

Email: ___________________

10.10 Modification/Amendments to this MOI. No modifications or amendments to this MOI shall be deemed effective unless and until executed by all Parties hereto.

10.11 Counterparts; Electronic Signatures. This MOI may be executed in multiple counterparts and by the parties on separate counterparts, each of which shall be deemed to be an original and all of which shall together constitute one and the same MOI. The Parties may execute and deliver this MOI by DocuSign or other electronic means. Such electronic signatures shall have the same binding effect as original signatures, and the Parties hereby waive any defense to validity based on any such copies or signatures.

10.12 Dispute Resolution.

10.12.1 In the event of a dispute regarding interpretation or implementation of this MOI, or if the Parties are unable to agree upon a matter as to which their agreement is provided for hereunder, the Parties will endeavor to resolve the dispute by using the service of a mutually acceptable mediator. Such mediation process shall be initiated within 30 days of a Party providing notice to the other that a matter requires mediation and such process shall be concluded within 60 days of such notice. The fees and expenses of the mediator shall be shared equally by the Parties.

10.12.2.5 Each Party shall bear its own attorneys' fees in any proceeding under this Paragraph 10.12.

10.13 Governing Law. This MOI shall be interpreted and construed according to the laws of the State of California.

IN WITNESS WHEREOF, the undersigned hereby execute this MOI as of the date first set forth above.

AVWS:

ANTELOPE VALLEY WATER STORAGE, LLC,
a Delaware limited liability company

By:_________________________________
Name:____________________________
Title:_____________________________

By:_________________________________
Name:____________________________
Title:_____________________________

INTERESTED PARTY:

____
, a ___________________

By:_________________________________
Name:____________________________
Title:_____________________________

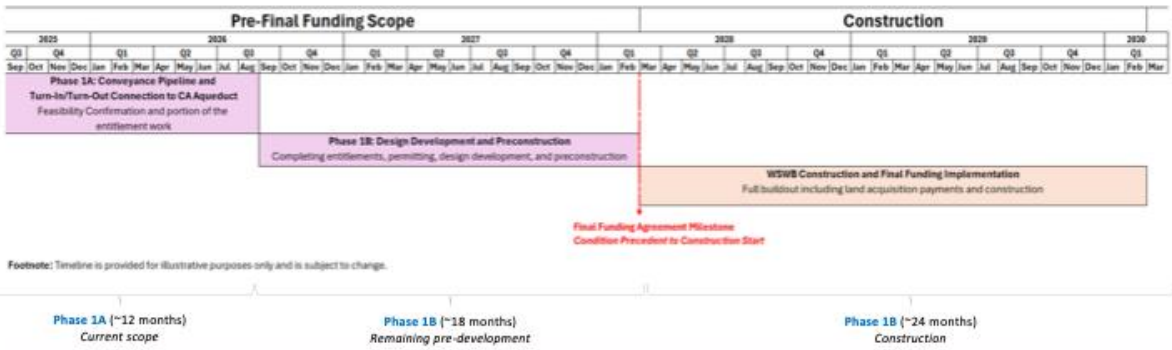
By:_________________________________
Name:____________________________
Title:_____________________________

EXHIBIT A

PROJECT SCHEDULE

Project Schedule

Willow Springs Water Bank



Phase 1A Objectives

1) Obtain environmental approvals (CEQA) for a CA Aqueduct connecting turnout and for the WSWB conveyance pipeline (IS/NMD)
2) Completion of the groundwater modeling study and storage agreement
3) Initiate design studies to develop basis of design and detailed feasibility analysis

<u>EXHIBIT B</u>

PROJECT BUDGET

Current Project Budget

Willow Springs Water Bank

		Full Build †	
	Budget ($ Millions)	905 TAF Storage *$ / AF*	204 TAFY Take *$ / AFY*
Phase 1A - Pre Development	$4.3		
Phase 1B - Soft Costs	33.4		
Land Acquisitions	20.4		
Construction:	436.0		
Pipeline & CA Aqueduct Connection	*78.0*		
Well Field & Percolation Ponds	*186.3*		
Power Related & Pump Station	*104.0*		
GC / Construction Mgmt / Other	*67.7*		
Subtotal	**$494.0**	***$546 / AF***	***$2,422 / AFY***
Construction Contingency	87.2	*96 / AF*	*427 / AFY*
Total Costs	**$581.2**	***$642 / AF***	***$2,849 / AFY***
(-) Remaining WSIP Grant Funding	($125.4)	*($139 / AF)*	*($615 / AFY)*
Net Project Cost	**$455.8**	***$504 / AF***	***$2,234 / AFY***
(-) WSIP Grant Funding Increase ‡	(32.1)	*(35 / AF)*	*(157 / AFY)*
Potential Net Project Cost	**$423.7**	***$468 / AF***	***$2,077 / AFY***

† Reflects total permitted capacity, less amounts previously committed.

‡ Reflects a potential pro-rata inflationary increase to WSWB's Maximum Conditional Eligibility Determination (MCED) not yet allocated.

Note: Put/Take capacities are based on environmentally permitted capacity under an EIR but may be impacted by CA aqueduct turnout capacity and a groundwater storage agreement, both work scopes in progress. Budget does not currently include a treatment facility; need for treatment is to be confirmed.

SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

DATE: August 18, 2026

TO: Board of Directors

FROM: Greg Woodside, Chief of Planning and Watershed Resilience
Wen Huang, Chief Operating Officer/ Assistant General Manager

SUBJECT: Consider an Agreement with University of California San Diego for Final Viability Assessment of Forecast Informed Reservoir Operations at Seven Oaks Dam

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Staff Recommendations

Staff recommends that the Board of Directors: (1) authorize the CEO/General Manager to execute an agreement with the University of California San Diego, Scripps Institution of Oceanography for an amount not to exceed $1,198,416 to develop the Final Viability Assessment of Forecast Informed Reservoir Operations (FIRO) at Seven Oaks Dam, subject to minor, non-substantive changes; and, (2) authorize the CEO/General Manager to execute a cost-share agreement with Western Water for FIRO expenses in the amounts equal to the Western-San Bernardino Watermaster split.

Summary

District staff have been collaborating with the Local Sponsors of Seven Oaks Dam, the Army Corps of Engineers (Army Corps), the Center for Western Weather and Water Extremes (CW3E) at the UC San Diego Scripps Institution of Oceanography (Scripps), Western Water, the resources agencies, environmental non-profit organizations and other stakeholders to prepare the Preliminary Viability Assessment (PVA) of FIRO at Seven Oaks Dam. The PVA has been completed and was published in July 2026. The PVA is favorable regarding FIRO at Seven Oaks Dam and recommends pursuing a planned deviation to the dam's Water Control Manual to test FIRO on a small scale. Staff proposes that San Bernardino Valley and Western Water work with the Local Sponsors for Seven Oaks Dam and the Army Corps to evaluate a planned deviation over the next two years. Preparation of the Final Viability Assessment will occur concurrently over the next two years as the proposed deviation is evaluated and processed. Staff also intend to pursue Prop 4 grant funding for this effort as it aligns well with DWR's focus areas of Groundwater Management,

and Climate Adaptation, and the goals of the California Water Plan update, as mandated by the SB-72 CA Water for All bill.

Description of FIRO Study

FIRO is a reservoir-operations strategy that informs decisions to retain or release water from existing dams by integrating additional flexibility in operating procedures using enhanced monitoring and improved weather and water forecasts (American Meteorological Society, 2020). FIRO utilizes weather forecasting, streamflow modeling, and watershed monitoring to help water managers selectively retain or release water from reservoirs based on current and forecasted conditions and adapt to weather extremes.

Seven Oaks Dam is operated and maintained by the three flood control districts in the Santa Ana Watershed. The three flood control districts in Orange County, Riverside County and San Bernardino County are collectively referred to as the 'Local Sponsors' for the Santa Ana River Mainstem Project, which includes Seven Oaks Dam. The Local Sponsors and Army Corps will need to approve proposed operational changes to Seven Oaks Dam that are developed to implement FIRO.

The Steering Committee for FIRO at Seven Oaks Dam guides the assessment of FIRO at Seven Oaks Dam. The Steering Committee includes representatives of the Local Sponsors, Army Corps, and other stakeholders. The Steering Committee is co-chaired by Heather Dyer, Dr. Marty Ralph (Scripps/CW3E), and Dr. Cary Talbot (Army Corps).

The Local Sponsors operate and maintain Seven Oaks Dam in accordance with the dam's Water Control Manual developed by the Army Corps. After construction of the dam was completed by the Army Corps, ownership, maintenance and operation of the dam was turned over to the Local Sponsors.

Consideration of potential changes to the Water Control Manual to implement FIRO involves multiple complex considerations, including:

- Maintaining the flood risk management (FRM) capacity and purpose of the dam
- Addressing environmental considerations, such as potential impacts on endangered species and their habitat
- Assessing how potential changes in the release rates to implement FIRO relate to operations and maintenance requirements for the dam

- Assessing potential water quality considerations, such as the potential impact on water quality of holding water longer in the pool behind the dam

Summary of PVA

The PVA was completed under the oversight of the Steering Committee. The technical work in the PVA was primarily completed by CW3E, with extensive support from a wide range of participants. A copy of the PVA is attached and can be accessed online at: https://cw3e.ucsd.edu/firo_seven_oaks

Key findings from the PVA include the following:

- Preliminary analyses suggest FIRO is viable for Seven Oaks Dam.
- Precipitation forecast skill for extreme events is ranked in the top 10 percent nationally, making Seven Oaks Dam an excellent candidate for FIRO.
- FIRO alternatives that simulated FIRO Spaces at less than 2,299 feet elevation (compared to current operations at an elevation of 2,220 feet) showed no impact to FRM metrics, while higher FIRO Spaces need further examination to better assess FRM and groundwater recharge outcomes.
- FIRO can increase groundwater recharge and water supply availability, with the largest improvements coming in wetter than average years and with higher winter storage in the reservoir.

Key recommendations in the PVA include the following:

- Refine FIRO Spaces below 2,299 feet (top of trash rack) and explore the elevation tradeoff point below 2,375 feet (25 percent of gross pool) for FRM and groundwater recharge outcomes.
- Refine reservoir operations and groundwater recharge modeling framework for a more granular assessment of metric performance.
- Install additional sensors to improve snow observations.
- Translate the environmental indicators into metrics to assess the environmental impacts or benefits of alternative reservoir operations.

- Assess options to provide authority to implement water conservation as a secondary purpose, subordinate to flood risk management.
- Pursue a planned deviation to the Water Control Manual to test FIRO on a relatively small scale.

Preparation of Final Viability Assessment

Based on the favorable PVA results, staff coordinated with CW3E to develop the scope of work for the Final Viability Assessment (FVA). The FVA proposal from Scripps includes four tasks:

- Task 1 – Management, coordination, communication and outreach
- Task 2 – Draft and produce the FVA report
- Task 3 – Implement modeling improvements to the viability assessment framework
- Task 4 – Targeted technical studies regarding enhanced monitoring, meteorological analysis and hydrologic forecasting

This effort builds on the PVA and will provide results that will support updating the Water Control Manual to implement FIRO at Seven Oaks Dam.

The total cost of the agreement with UC San Diego/CW3E for the FVA is $1,198,416. The work is anticipated to be completed in two years.

Preliminary Timeline for Implementation of FIRO

The following table describes the schedule for the implementation of FIRO at Seven Oaks Dam:

Phase	Activity	Schedule
Work Plan	Prepare FIRO Viability Assessment Work Plan	June 2024 (complete)
Preliminary Viability Assessment	Prepare FIRO PVA Report	July 2026 (complete)
Final Viability Assessment	Prepare FIRO Final Viability Assessment Report	September 2026 to September 2028

Deviation to Water Control Manual	Evaluate and Process Deviation with Local Sponsors and Army Corps	August 2026 to July 2028
Post-Final Viability Assessment	Update Seven Oaks Dam Water Control Manual to incorporate FIRO (Army Corps lead)	To Be Determined

Evaluation of Deviation to Test FIRO

The PVA provides important information that can be used to support evaluation of a deviation to the Water Control Manual to test FIRO. A 'deviation' is a limited-term change from the dam's Water Control Manual. In this case, the deviation request would be to test implementation of FIRO at Seven Oaks Dam for a multi-year period (up to five years) on a relatively small scale (a relatively small percentage of the total storage volume). The Army Corps has approval authority of a deviation.

Evaluation of the deviation includes technical analysis regarding dam safety, maintaining flood risk management, environmental analysis, estimated increased costs for the Local Sponsors to implement the deviation and related items.

Staff has been working with Orange County Public Works (OCPW) staff regarding the next steps to request a deviation. Additionally, a proposed deviation has been discussed with the Steering Committee that guides the FIRO assessment.

Staff plan to bring an agenda item to the Board later this year to discuss the deviation process in additional detail.

Cost Share Agreement with Western Water

The proposed FIRO expenses will be cost-shared with Western Water per the Western-San Bernardino Watermaster cost allocation formula of 72.05% for San Bernardino Valley and 27.95% for Western Water. The proposed cost share for the agreement with UC San Diego/Scripps for the preparation of the FVA is summarized in the table below:

Item	Cost
UC San Diego FIRO Final Viability Assessment	$1,198,416
San Bernardino Valley Cost Share (72.05%)	$863,459
Western (representing Plaintiffs) Cost Share (27.95%)	$334,957

District Strategic Plan Application

FIRO aligns with the San Bernardino Valley Strategic Plan Foundation and Goals and Objectives by developing additional supplies for stormwater capture at Seven Oaks Dam for recharge into the Bunker Hill Basin. Implementation of FIRO supports Goal 1.1 'Ensure Agency facilities, infrastructure, assets, and habitat investments are resistant or resilient to impacts from changing climate conditions.' and its related objective 'Develop a comprehensive strategy to identify long-term uncertainties and adaptive management measures to ensure reliable water supply and protection of habitat investments under climate change conditions.' FIRO also supports Goal 2.2 'Increase local water supplies.'

Fiscal Impact

The total cost of the agreement with UC San Diego/Scripps over the two-year performance period is $1,198,416. Funds for this item are included in the approved 2026/2027 approved budget. This cost will be shared with Western Water, subject to the District and Western Water approving a cost-share agreement.

Attachments:

1. Seven Oaks Dam FIRO Preliminary Viability Assessment - July 2026
2. Proposal from UC San Diego for Development of Final Viability Assessment

Title

Seven Oaks Dam Forecast Informed Reservoir Operations Preliminary Viability Assessment

Authors

Ralph, F M

Talbot, Cary

Dyer, Heather

et al.

Publication Date

2026-07-01

Data Availability

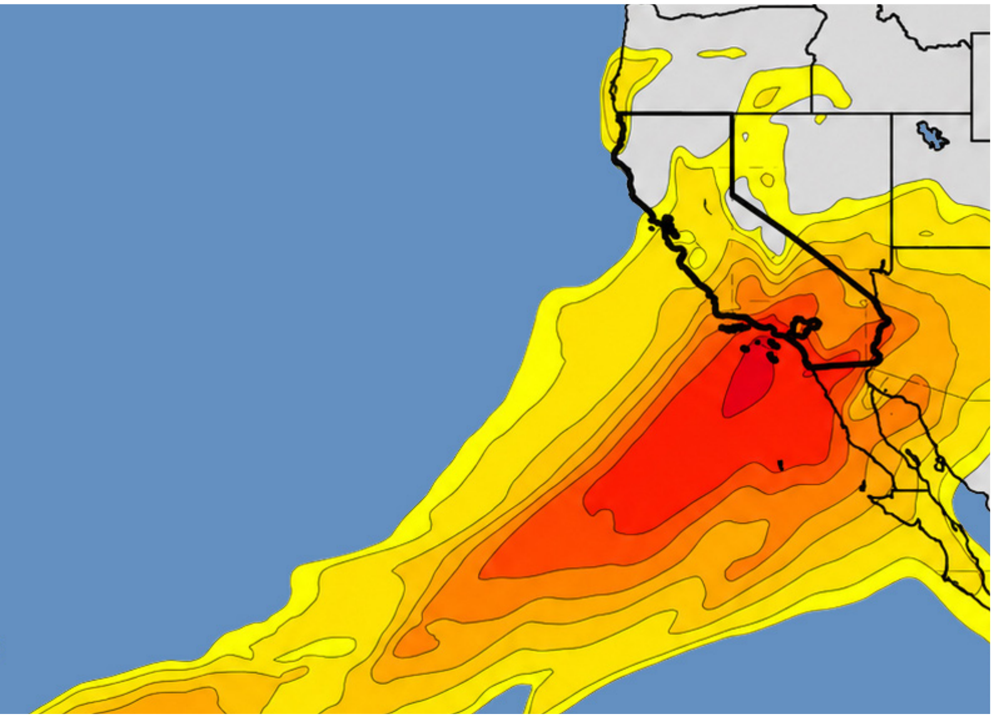
The data associated with this publication are in the supplemental files.

Seven Oaks Dam

FORECAST INFORMED RESERVOIR OPERATIONS

Preliminary Viability Assessment

July 2026



Steering Committee

- **F. Martin Ralph:** CW3E (Co-chair)
- **Cary Talbot:** USACE ERDC (Co-chair)
- **Heather Dyer:** San Bernardino Valley Municipal Water District (Co-chair)
- **Michael Anderson:** California Department of Water Resources
- **Rebecca Christensen:** U.S. Fish and Wildlife Service
- **Van Crisostomo:** USACE
- **Michael Fam:** San Bernardino County Public Works
- **Joseph Forbis:** USACE ERDC
- **Lisa Haney:** Orange County Water District
- **Jayme Laber:** NOAA National Weather Service
- **Betsy Miller:** San Bernardino Valley Water Conservation District
- **Mallory O'Conor:** Western Municipal Water District
- **James Tyler:** Orange County Public Works

Seven Oaks Dam Steering Committee Co-chairs

- **F. Martin Ralph**, Director, Center for Western Weather and Water Extremes (CW3E), Scripps Institution of Oceanography, University of California San Diego
- **Cary Talbot**, National Lead, Forecast-Informed Reservoir Operations Program, Engineer Research and Development Center (ERDC), U.S. Army Corps of Engineers (USACE)
- **Heather Dyer**, Chief Executive Officer/General Manager, San Bernardino Valley Municipal Water District (San Bernardino Valley)

Seven Oaks Dam Steering Committee Members

- **Michael Anderson**, State Climatologist, California Department of Water Resources
- **Rebecca Christensen**, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service
- **Van Crisostomo**, Assistant Chief, Engineering Division, USACE Los Angeles District
- **Michael Fam**, Engineering Manager/Division Chief, Flood Control Planning/Water Resources Division, San Bernardino County Public Works
- **Joseph Forbis**, USACE Water Management Integration Lead, USACE ERDC
- **Lisa Haney**, Executive Director of Planning and Natural Resources, Orange County Water District
- **Jayme Laber**, Senior Hydrologist, National Oceanic and Atmospheric Administration (NOAA) National Weather Service
- **Betsy Miller**, General Manager, San Bernardino Valley Water Conservation District
- **Mallory O'Conor**, Water Resources Manager, Western Municipal Water District
- **James Tyler**, Manager, Flood Programs Division, Orange County Public Works

Support Staff

- **Greg Woodside**, San Bernardino Valley
- **Arleen O'Donnell**, Eastern Research Group, Inc.
- **Rob Hartman**, Robert K. Hartman Consulting Services
- **Kyla Van Maanen**, CW3E
- **Kyla Semmendinger-Raney**, CW3E

Contributors

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- **Center for Biological Diversity**: Ileene Anderson, Sophia Prado-Irwin
- **Cornell University**: Scott Steinschneider
- **CW3E**: Ty Brandt, Zach Brodeur, Sarah Burnett, Chris Castellano, Ava Cooper, Jay Cordeira, John Deane, Luca Delle Monache, Taylor Dixon, Mahdi Erfani, Lillian Gilmore, Kayden Haleakala, Chad Hecht, Julie Kalansky, Lisa Katz, Gabe Lewis, Laura Martin, Abdul Moiz, Ethan Morris, Andy Richards, Shawn Roj, Emily Slinskey, Rachel Weihs, Jeri Wilcox, Anna Wilson, Subin Yoon, Jeff Zimmerman
- **Endangered Habitats League**: Dan Silver
- **Elsinore Valley Municipal Water District**: Jesus Gastelum
- **NOAA California Nevada River Forecast Center**: Pete Fickenscher, Peggy Lee, Brett Whitin
- **Orange County Public Works**: Ted Dang, Jennifer Shook, Kenneth Tran
- **Orange County Water District**: Adam Hutchinson, David McMichael, Kevin O'Toole, Sheryl Parsons
- **Riverside Public Utilities**: Drew Faherty

- **San Bernardino Valley**: Leo Ferrando, Joanna Gibson, Wen Huang, Chris Jones, Kelly Malloy, Adekunle Ojo, Kai Palenscar
- **San Bernardino Valley Water Conservation District**: Tom Crowley, John Lambie, Milan Mitrovitch, Jason Wolf
- **Scripps Institution of Oceanography**: Lauren Wood
- **USACE ERDC**: Eric Shearer
- **USACE Los Angeles District**: Kim Gilbert, Ken Lawler, Hayley Lovan, Jennifer Ramos Ortiz, Megan Wong
- **USACE South Pacific Division**: Cuong Ly
- **University of California Riverside**: Eric Barefoot
- **U.S. Department of Agriculture Forest Service**: Kelley Giron
- **U.S. Fish and Wildlife Service**: Holly Callahan, Karin Cleary-Rose, Jessica D'Ambrosio, Jane Hendron
- **Western Municipal Water District**: Josh Aguilar

The Steering Committee is supported by eight work teams:

- Communications
- Environmental resources
- Forecast verification
- Groundwater recharge
- Hydrology
- Meteorology
- Observations
- Water resource engineering

Suggested Citation

Ralph, F.M., Talbot, C., Dyer, H., Anderson, M., Christensen, R., Crisostomo, V., Fam, M., Forbis, J., Haney, L., Laber, J., Miller, B., O'Conor, M., Tyler, J. (2026). Seven Oaks Dam Forecast Informed Reservoir Operations Preliminary Viability Assessment. UC San Diego.

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Abbreviations

For brevity, this document uses the following abbreviations:

Abbreviation	Definition
ac-ft	acre-feet
AR	atmospheric river
cfs	cubic feet per second
CNRFC	California Nevada River Forecast Center
CW3E	Center for Western Weather and Water Extremes
EFO	Ensemble Forecast Operations
ERDC	Engineer Research and Development Center
FIRO	Forecast Informed Reservoir Operations
FVA	Final Viability Assessment
HEFS	Hydrologic Ensemble Forecast System
HEMP	hydrologic engineering management plan
IVT	integrated vapor transport
LAD	Los Angeles District
MAP	mean areal precipitation
MCSG	Mill Creek spreading grounds
MPC	Model Predictive Control
MWDSC	Metropolitan Water District of Southern California
NOAA	National Oceanic and Atmospheric Administration
PVA	Preliminary Viability Assessment
RAFSS	Riversidean alluvial fan sage scrub
RAOP	Research And Operations Partnership
RDF	reservoir design flood
SARSG	Santa Ana River spreading grounds
SBCFCB	San Bernardino County flood control basins
SFO	Summary Forecast Operations
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WCM	Water Control Manual
WCP	Water Control Plan
West-WRF	Western Weather Research and Forecasting
WFR	Weighted Forecast Release
WRE	Water Resources Engineering

Executive Summary

Built in 1999, Seven Oaks Dam is a 550-foot-high earth and rock fill dam that impounds the Santa Ana River (Figure ES-1) in the San Bernardino National Forest. It was constructed as part of a larger approximately $2 billion flood control effort called the Santa Ana Mainstem Project.

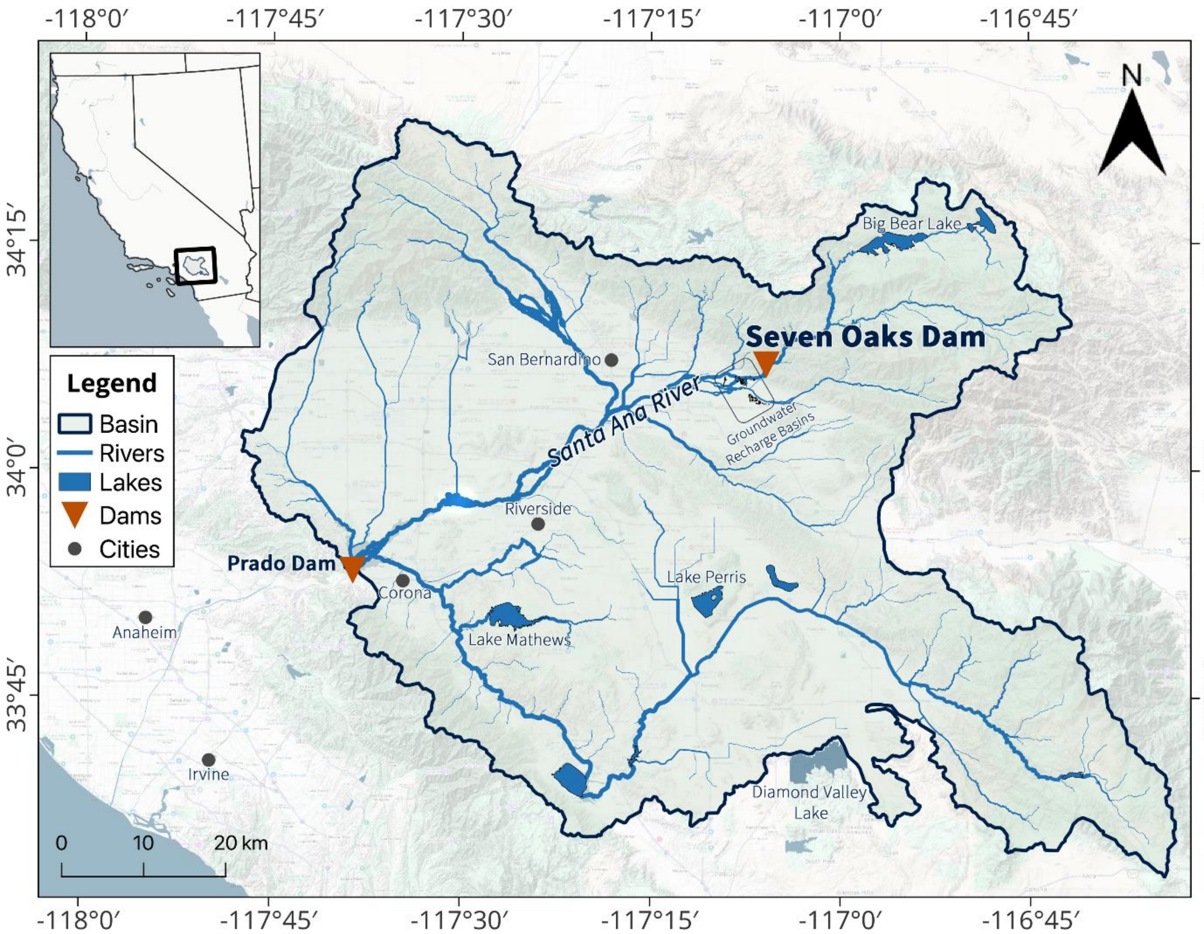

Figure ES-1. *The Santa Ana River watershed.*

Seven Oaks Dam is operated and maintained by Orange County Flood Control District, Riverside County Flood Control and Water Conservation District, and San Bernardino County Flood Control District. Currently, the dam is authorized for flood risk management (FRM).

This Preliminary Viability Assessment (PVA), initiated by San Bernardino Valley Municipal Water District and undertaken by an interagency Steering Committee (page ii), explores possibilities for water conservation to increase groundwater recharge for regional water reliability and to enhance habitat for protected species, while maintaining or enhancing FRM using improved monitoring, as well as improved weather and runoff forecasts. The steering committee includes key decision makers and stakeholders that have the authority to commit time and resources. The steering committee guides the Forecast Informed Reservoir Operations (FIRO) viability assessment process to develop a full understanding of the watershed and the project features, identify analyses and data needs, and scope a host of variables and constraints associated with managing water resources in the basin. The Steering Committee meets regularly and actively contributes to the project work, with a key goal of establishing collaboration amongst the agencies.

What is FIRO?

FIRO is a flexible water management approach that uses data from watershed monitoring and improved weather forecasting to help water managers selectively retain or release water from reservoirs for increased resilience to droughts and floods. FIRO applies emerging science and technology to optimize water resources and adapt to climate change without costly infrastructure.

The PVA, which builds on the Seven Oaks FIRO workplan (Ralph et al. 2024), assessed 16 alternative water resources operational scenarios to determine their efficacy relative to a set of environmental, water supply availability, and FRM metrics. Key findings and recommendations are presented below. A full list of findings and recommendations can be found in Sections 3–5.

Key Findings

- Preliminary analyses suggest FIRO is viable for Seven Oaks Dam.
- Forecast skill for extreme events is ranked in the top 10 percent nationally, making Seven Oaks Dam an excellent candidate for FIRO.
- FIRO alternatives that simulated FIRO Spaces at less than 2,299 feet (compared to current operations at an elevation of 2,220 feet) showed no impact to FRM metrics, while higher FIRO Spaces need further examination to better assess FRM and groundwater recharge outcomes.
- FIRO can increase groundwater recharge across all facilities, with the largest improvements coming in wetter than average years and with higher winter storage in the reservoir. Differences in recharge outcomes across FIRO alternatives are driven by the top of the FIRO Space, with higher FIRO Spaces enabling higher recharge.
- Indicators to explore potential environmental changes showed little variation between FIRO alternatives and Water Control Manual (WCM) operations for downstream conditions. Variations between alternatives for upstream conditions are influenced by the FIRO Space.

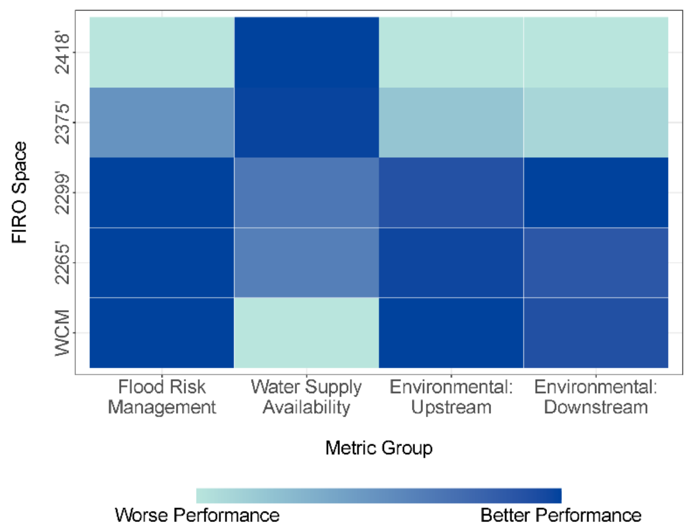

Figure ES-2. *Comparison of baseline conditions (WCM) and four alternative FIRO spaces according to key performance metrics assessed in the PVA.*

Key Recommendations

- Refine FIRO Spaces below 2,299 feet (top of trash rack) and explore the elevation tradeoff point below 2,375 feet (25 percent of gross pool) for FRM and groundwater recharge outcomes.
- Refine reservoir operations and groundwater recharge modeling framework for a more granular assessment of metric performance.
- Install additional sensors to improve snow observations.
- Translate the environmental indicators into metrics to assess the environmental impacts or benefits of alternative reservoir operations.
- Assess options to provide authority to implement water conservation as a secondary purpose, subordinate to FRM.
- Pursue a planned deviation to the WCM to test FIRO on a relatively small scale.

Next Steps

The results of this PVA support advancing FIRO at Seven Oaks Dam into a Final Viability Assessment (FVA). The FVA will build on the PVA by prioritizing additional analyses, engaging work teams, and continuing coordination with the Steering Committee to support decision making. Consideration should be given to coordinating with the local sponsors to process a U.S. Army Corps of Engineers (USACE)-approved planned deviation from the current WCM to test FIRO. FIRO Spaces between approximately 2,220 feet and 2,265 feet are candidates for interim testing through a deviation, given demonstrated water supply benefits, without compromising FRM. If a deviation is approved, the local sponsors will have more operational flexibility, while retaining discretion to operate the dam in accordance with the WCM.

Implementing FIRO will require continued coordination with local sponsors and USACE regarding the authority for water conservation as a secondary purpose of Seven Oaks Dam. Decision support tools will be further evaluated and enhanced during the FVA to ensure operators have the situational awareness and modeling capabilities needed for forecast-informed operations. The FVA is expected to be completed by 2028, with the ultimate goal of updating the WCM to formally incorporate FIRO operations, subject to USACE approval.

Section 1. Introduction

California has one of the most variable climates in the United States, and it is getting more extreme—increasingly marked by long periods of warm, dry conditions punctuated by stronger and wetter atmospheric river (AR) storms.

ARs are responsible for more than half of all beneficial precipitation and over 90 percent of flood damage in California. These long, narrow bands of concentrated moisture stretch thousands of miles across the Pacific Ocean. When ARs make landfall, they can release a staggering amount of rain and snow: during a particularly active AR season from November 2022 to April 2023, 17 ARs produced an average of 29 inches of precipitation in the Santa Ana River watershed (Figure 1-1).

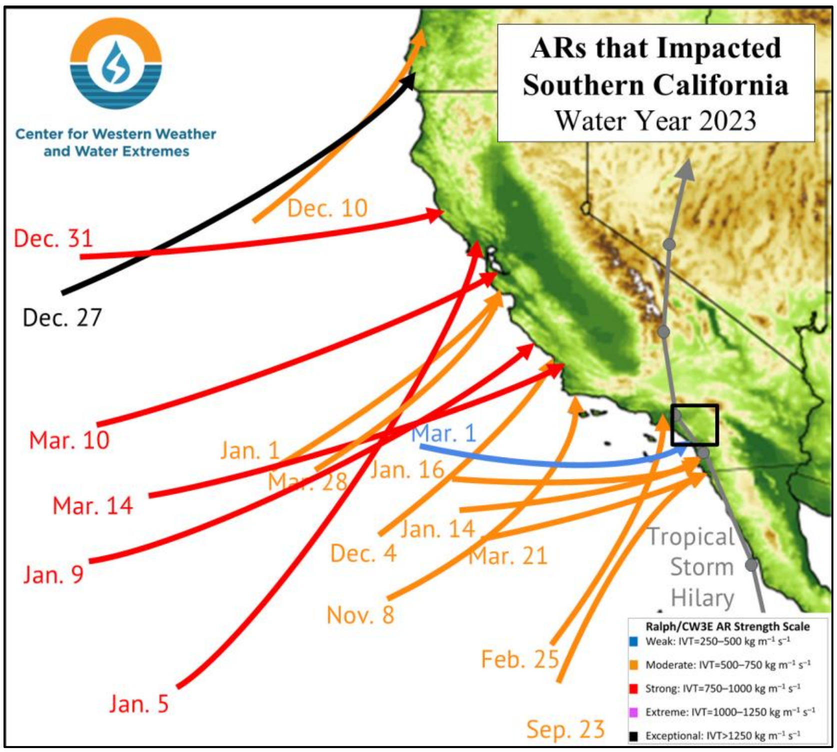

Figure 1-1. *Seventeen ARs and a tropical cyclone brought record-breaking snowfall to the area in 2023. The ARs dropped more than 240 inches of snow at Big Bear. Note: ARs making landfall outside the Santa Ana River watershed affect the watershed as they move along the coast.*

Since ARs are the main drivers of floods, and the absence of ARs is often associated with droughts, improved AR forecasts are essential for Forecast Informed Reservoir Operations (FIRO). Recognizing the importance of ARs in a changing climate, the San Bernardino Valley Municipal Water District (San Bernardino Valley) and Western Municipal Water District (Western Water) have partnered with the Center for Western Weather and Water Extremes to explore the potential for FIRO at Seven Oaks Dam. FIRO is a flexible water management strategy that uses improved weather and runoff forecasts to help water managers retain or release reservoir water for increased resilience to weather extremes.

FIRO results at Lake Mendocino show that reservoir operators can use forecast information and tools to plan for storing up to 20 percent more water when forecasts indicate low risk of flooding. At Prado Dam, about 35 miles downstream of Seven Oaks Dam (Figure 2-1), FIRO operations can result in 8 to 11 percent more groundwater recharge, on average.

Seven Oaks Dam is operated and maintained by the project sponsors: Orange County Flood Control District, San Bernardino County Flood Control District, and Riverside County Flood Control and Water Conservation District. Reservoir regulation for Seven Oaks Dam is conducted by the Orange County Flood Control District staff following the approved Water Control Plan (WCP), contained in a Water Control Manual (WCM; USACE 2003) provided by the U.S. Army Corps of Engineers Los Angeles District.

The Seven Oaks Dam FIRO project is the first FIRO project that (1) is significantly snowmelt-fed, (2) includes habitat enhancement as a primary objective, and (3) incorporates consideration for several protected species.

FIRO at Seven Oaks Dam is a Research and Operations Partnership (RAOP), a term coined for FIRO projects to convey the symbiotic relationship between research and water operations. Research is driven by water managers' needs; research findings inform, and feed directly into, operational decisions. RAOP consists of researchers, water managers, dam operators, and environmental scientists with vested interests in improving dam operations to achieve multiple benefits. A Seven Oaks Dam FIRO Steering Committee (members listed on page i) was formed to represent these interests and to answer a key question: *Can current and improved forecasts of precipitation, temperature, and runoff associated with landfalling ARs and other storms be used to employ flexible reservoir operations at Seven Oaks Dam to increase water conservation and enhance and protect habitat through strategic releases, while continuing to meet flood risk management objectives?*

To help answer this question, the project team has developed this Preliminary Viability Assessment (PVA). The PVA is an early, science-based evaluation that uses existing forecast skill, historical and simulated hydrologic data, and current operational constraints to examine whether FIRO could be feasible and beneficial at Seven Oaks Dam. It identifies the most promising opportunities for increasing water conservation and habitat benefits; highlights potential limitations or risks; and outlines the additional analyses, tools, or infrastructure that would be needed for full FIRO implementation. The PVA provides a structured foundation for deciding whether and how FIRO could advance to later phases of development at Seven Oaks Dam. It is the third step of a process culminating in a WCM update (Figure 1-2).

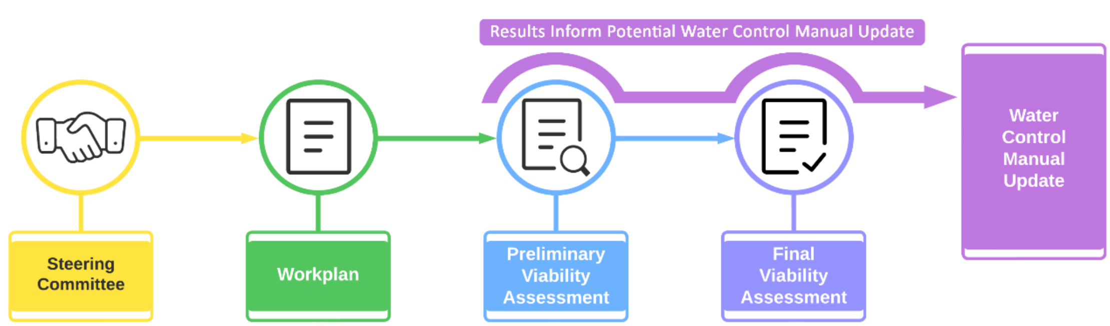

Figure 1-2. *The FIRO process steps.*

Section 2. Background and Context

2.1 Santa Ana River Watershed

The Santa Ana River watershed is the largest in Southern California's coastal region. It encompasses about 2,650 square miles and parts of San Bernardino, Riverside, Orange, and Los Angeles counties. The upper watershed is ringed by the San Gabriel, San Bernardino, and San Jacinto mountain ranges, with elevations over 10,000 feet. These mountains form a barrier to atmospheric river (AR) storms that originate in the Pacific Ocean and make landfall in Southern California, forcing moist flow upward and generating clouds and precipitation. Lowlands consist mainly of dry alluvial valleys. The watershed has over 10 vegetation zones, including alpine and subalpine areas in high elevations and pine, lodgepole, and oak forests at mid-elevations. Chaparral and coastal sage scrub are common in lower elevations, and riparian forest and marshes can be found along the riverbed. Figure 2-1 shows a map of the watershed.

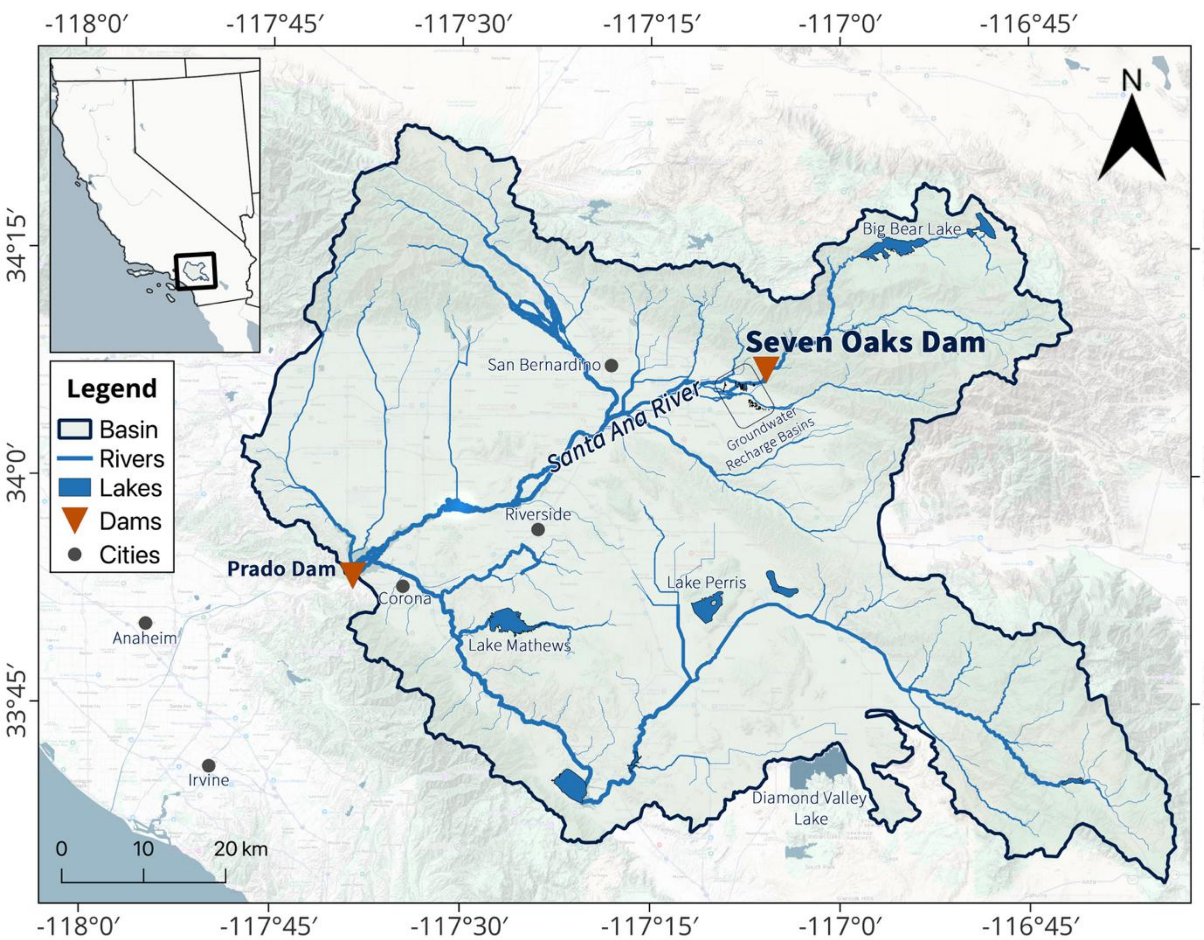

Figure 2-1. *Santa Ana River watershed. Seventy-four percent of the watershed area above Seven Oaks Dam is at an elevation higher than 6,234 feet (1,900 meters) above mean sea level. (Credit: San Bernardino Valley Municipal Water District.) The groundwater recharge basins shown on the map are the primary basins included in the PVA analysis. However, there are additional recharge facilities throughout the basin not considered in this analysis.*

Approximately 6 million people live in the Santa Ana River watershed. Water supply reservoirs within the area include Lake Mathews, Lake Perris, Lake Skinner, Diamond Valley Lake, and Irvine Lake. In addition, Prado Dam, which was constructed for flood risk management, is also operated to facilitate groundwater recharge under certain conditions, providing valuable water supply for Orange County Water District.

Most of the watershed area above Seven Oaks Dam is within the San Bernardino National Forest. The Santa Ana River above Seven Oaks Dam is free flowing, with a steep gradient (300 feet per mile) and highly erodible soil. Below Seven Oaks Dam, as the river enters the lower basin, much of the flow is diverted for municipal and agricultural water supply and groundwater recharge. Flow downstream of San Bernardino during the dry season (referred to as "the perennial stream") is dominated by effluent from nine wastewater treatment plants. Stormwater runoff in the lower basin is collected behind Prado Dam. Below Prado Dam, Orange County Water District diverts an average of approximately 55,000 acre-feet (ac-ft) per year from Prado Dam releases into recharge basins, which provides about one-third of its municipal water supply yearly.

2.2 Local Agency Partnerships

The San Bernardino Valley Municipal Water District (San Bernardino Valley) is a wholesale water and groundwater management agency serving approximately 714,000 people across more than 350 square miles in the eastern San Bernardino Valley, Crafton Hills, and parts of Yucaipa Valley. Its service area includes the cities of San Bernardino, Redlands, Loma Linda, Rialto, Colton, Highland, Grand Terrace, Yucaipa, and portions of Fontana, as well as nearby unincorporated communities.

The Western Municipal Water District (Western Water) is one of the largest public agencies in Riverside County, providing water, wastewater (sewer), and recycled water services to nearly 1 million people, both wholesale and retail customers, across 527 square miles in western Riverside County. Western Water represents several entities in Riverside County under a 1969 court ruling, including the City of Riverside, Riverside Highland Water Company, Meeks & Daley Water Company, and the University of California.

Together, San Bernardino Valley and Western Water hold rights to divert up to 198,000 ac-ft per year from the Santa Ana River and store up to 50,000 ac-ft annually at Seven Oaks Dam. A 1969 groundwater adjudication (Western-San Bernardino Judgment) established the rights and obligations for San Bernardino Valley and Western Water entities in the San Bernardino Basin Area and adjacent groundwater basins. The provisions of the Western-San Bernardino Judgment are enforced and administered by a court-appointed Watermaster consisting of one member nominated by San Bernardino Valley and one member nominated by Western Water, to represent the interests of the San Bernardino County entities and San Bernardino Basin Area pumpers that export water to Riverside County, respectively.

Water released from Seven Oaks Dam is recharged by San Bernardino Valley into the Upper Santa Ana Valley–San Bernardino subbasin, which is also referred to as the San Bernardino Basin Area and supplies water to roughly 1 million people in San Bernardino and Riverside counties. Water released from the dam can also be conveyed to flood control basins operated by San Bernardino County Public Works for groundwater recharge. Western Water is a member agency of the Metropolitan Water District of Southern California (MWDSC) and is initiating discussions with MWDSC to develop the required agreements to divert releases from Seven Oaks Dam to MWDSC reservoirs. See Section 3.2.1.a for more information.

In additional to locally available water, San Bernardino Valley also imports water from the State Water Project via the East Branch aqueduct through Lake Silverwood. San Bernardino Valley's annual State Water Project allocation is 102,600 ac-ft, though deliveries vary from 70–100 percent in wet years to as low as 5 percent in dry years. Regional population growth of 15–20 percent projected by 2045 will increase future demand for water. Current and future supplies are expected to come from a combination of State Water Project imports, local surface and recycled water, groundwater pumping, and Santa Ana River flows released at Seven Oaks Dam, which can contribute up to 100,000 ac-ft in a wet year and as much as 200,000 ac-ft under future estimated water supply conditions (Appendix 2.1; Table 2-1).

2.3 Seven Oaks Dam and Reservoir

2.3.1 History and Authorized Uses

Following the devastating 1938 flood, Prado Dam was built in 1941. To further improve regional flood protection, Congress authorized the Santa Ana River Mainstem project in 1986, which included constructing Seven Oaks Dam (Figure 2-2). Completed in 1999, the 550-foot-high earth and rockfill dam cost about $450 million and provides protection for communities across Orange, Riverside, and San Bernardino counties. As part of construction, 764 acres of open space were permanently set aside to protect three federally listed species: the Santa Ana River woolly-star, San Bernardino kangaroo rat, and slender-horned spineflower.

Figure 2-2. *Seven Oaks Dam. (Credit: Steve Schumaker via Wikimedia Commons, released under CC BY-SA 1.0.)*

2.3.2 Existing Operations

While Seven Oaks Dam is currently authorized for flood risk management, San Bernardino Valley and Western Water are interested in adding water conservation as a secondary purpose of the dam. The dam is jointly operated by the Orange, San Bernardino, and Riverside County Flood Control Districts following the U.S. Army Corps of Engineers' (USACE's) 2003 Water Control Manual (WCM), as amended. Water stored in the intermediate pool and the debris pool provide incidental benefits, allowing operators to adjust release timing to support downstream habitat and groundwater recharge when conditions permit. Releases are typically kept below 500 cubic feet per second (cfs) but may increase to 7,000 cfs during flood events if the reservoir pool impoundment reaches the main flood control pool. Seven Oaks Reservoir is drawn down each summer (by September 1) to allow time for annual maintenance and ensure it is ready for the next flood season.

Operational goals are seasonal: Build the debris pool beginning October 1 and maintain the debris pool throughout the storm season (October–April), then draw the entire reservoir down to the top of the sediment pool by September 1.

FRM operations at Seven Oaks require close coordination with Prado Dam during a significant flood runoff event. During these times, if water levels are rising at Prado, Seven Oaks discharge is limited to 500 cfs until downstream conditions and inflow conditions at Prado Dam stabilize, after which flows are increased to maximize FRM benefits at Seven Oaks Dam and lower the water surface elevation. Slower, extended releases through winter and spring would improve recharge efficiency, but this approach is not yet standard practice.

Currently, the Orange County Flood Control District follows the 2003 Water Control Plan (WCP), using National Weather Service forecasts and consulting with the USACE Reservoir Regulation Section, as needed, to manage Seven Oaks Dam releases. If the water surface elevation at Seven Oaks Dam is above the debris pool, dam operators may lower reservoir levels in advance of a storm to create storage capacity and adjust releases as conditions evolve. During the storm season, operations generally aim to return the reservoir to the top of the debris pool. Section 3.1.3.a provides detailed information on Seven Oaks Dam operations.

Figure 2-3 shows a simplified storage allocation diagram from the Seven Oaks Dam WCP. Elevations in the figure have not yet been finalized by Orange County Public Works and USACE Los Angeles District.

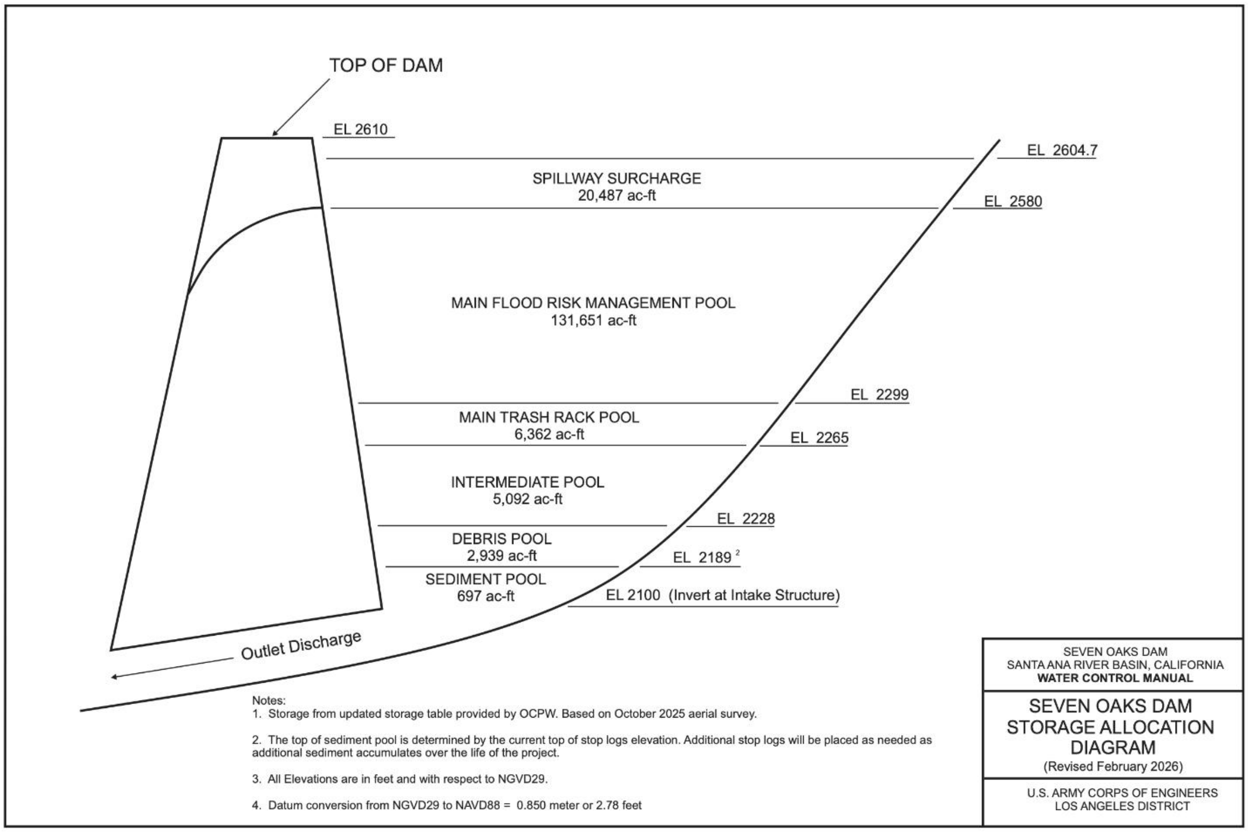

Figure 2-3. *Simplified storage allocation diagram from the Seven Oaks Dam WCP. Revised February 2026 (plate 7-01). (Source: USACE Los Angeles District.)*

2.4 Infrastructure

Facilities in the Seven Oaks Dam watershed support flood management, hydropower, and groundwater recharge, including access roads and two hydroelectric powerhouses recently acquired by San Bernardino Valley. The dam system consists of an intake structure, tunnel, discharge gates, and a plunge pool that releases water to the Santa Ana River, with operations governed by the USACE Seven Oaks WCP. Water released from the dam is recharged into the San Bernardino Basin Area by San Bernardino Valley. In 2024, San Bernardino Valley and Western Water (representing the Riverside County entities that pump from the San Bernardino basin area) completed Phase 1B of the Santa Ana River Enhanced Recharge Project, expanding recharge capacity and enabling up to 78,500 ac-ft of additional recharge in wet years.

2.5 Environmental Objectives

2.5.1 Governing Documents

Environmental requirements for Seven Oaks Dam were established through a series of documents developed during the Santa Ana River Mainstem project review process. Biological Opinions issued by the U.S. Fish and Wildlife Service in 1989 and 2002 concluded that project operations would not jeopardize federally listed species—including the Santa Ana River woolly-star, slender-horned spineflower, and San Bernardino kangaroo rat (Figure 2-4)—if specific mitigation measures were implemented. The 1989 Biological Opinion resulted in the creation of the 764-acre Woolly Star Preserve Area to offset project impacts. The 2002 Biological Opinion added further conservation measures and required that Seven Oaks Dam allow occasional large releases when needed to maintain habitat within the preserve, a provision incorporated into the 2003 WCM. To support long-term stewardship, USACE completed a Multi-Species Habitat Management Plan in 2012 (USACE 2012) that outlines ongoing monitoring and adaptive management actions, including potential environmental enhancement releases, to sustain species and habitats in the preserve.

Figure 2-4. *Least Bell's Vireo, Slender-horned spineflower, Santa Ana River woolly star, and San Bernardino kangaroo rat. (Credit: U.S. Geological Survey, public domain; California Department of Fish and Wildlife, photo by Susan Cochran; Steve Schumaker via Wikimedia Commons, CC BY-SA 1.0; U.S. Fish and Wildlife Service, public domain.)*

2.5.2 Water Quality

After construction finished on Seven Oaks Dam, water agencies that treat water released from the dam and deliver it as potable water reported changes in water quality, prompting several studies. Camp Dresser & McKee (2005) reported increased turbidity, organic materials, algal blooms, iron, manganese, among other constituents. The USACE Engineer Research and Development Center conducted additional studies (USACE 2014) to support modifying the 2003 WCP to discontinue the seasonal debris pool maintenance by building a debris pool only in response to forecasted rain events and then draining the debris pool entirely when the rainfall runoff event has passed. This change would have addressed concerns about seasonal retention of winter flood season's turbid runoff and other water quality degradation concerns. Ultimately, however, the 2003 WCP was not updated with findings from the study.

Water quality concerns were also described in the Environmental Impact Report for San Bernardino Valley and Western Water's Santa Ana River water rights application. To address these concerns, the State Water Resources Control Board added requirements that any releases from storage intended for re-diversion must meet applicable water quality objectives and be coordinated with the California Department of Water Resources Chief Deputy Director for Water Quality. See Appendix 5.7.1 for more information.

2.5.3 Habitat Restoration and Conservation

Several regional habitat conservation plans guide environmental protection in areas influenced by Seven Oaks Dam operations and downstream recharge activities. The Western Riverside County Multiple Species Habitat Conservation Plan (County of Riverside 2003) covers 146 species and provides mitigation for major development and infrastructure projects in western Riverside County, including the four species addressed in the 2002 Biological Opinion.

The U.S. Fish and Wildlife Service approved the Upper Santa Ana River Wash Habitat Conservation Plan in 2020 (San Bernardino Valley Water Conservation District 2023). This plan includes 4,892 acres in the alluvial plain downstream of Seven Oaks Dam. Its primary goal is to balance the ground-disturbing effects of groundwater recharge and other activities with the conservation of natural communities and populations of Santa Ana River woolly-star, slender-horned spineflower, San Bernardino kangaroo rat, and other sensitive species.

A third plan, the Upper Santa Ana River Habitat Conservation Plan, is currently being developed and will cover nearly 863,000 acres in San Bernardino and Riverside counties. This plan will facilitate permitting water management and flood control activities while protecting and restoring habitat for 20 species. San Bernardino Valley is working with the U.S. Fish and Wildlife Service to complete the Upper Santa Ana River Habitat Conservation Plan. All three plans include restoration actions and monitoring programs that will help track habitat conditions and species responses over time.

Protected Species of Interest to FIRO at Seven Oaks Dam

- Cactus wren
- Coastal California gnatcatcher
- Least Bell's vireo
- Southwestern willow flycatcher
- Yellow-breasted chat
- San Bernardino kangaroo rat
- Los Angeles pocket mouse
- Western spadefoot toad
- Arroyo chub
- Santa Ana sucker
- Slender-horned spineflower
- Santa Ana River woolly-star

Habitat protection and enhancement are central to the Seven Oaks Dam Forecast Informed Reservoir Operations (FIRO) project. Section 5.7 of this Preliminary Viability Assessment (PVA) presents preliminary environmental indicators to compare FIRO alternatives with respect to potential changes for habitat and protected species across three geographic focus areas: the upstream inundation zone, the alluvial fan and Santa Ana River Wash, and the perennial stream reach extending to Prado Dam. These indicators provide a means to assess how operational changes may enhance, maintain, or impact ecological resources within these areas.

More detailed background information is presented in the workplan for Seven Oaks Dam FIRO (Ralph et al. 2024) and references below.

2.6 References

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Section 3. How FIRO Viability Was Assessed

The Seven Oaks Dam Forecast Informed Reservoir Operations (FIRO) Steering Committee collaboratively developed and finalized a multiyear workplan to assess the viability of FIRO for Seven Oaks Dam operations in June 2024 (Ralph et al. 2024). Specifically, the plan called for assessing the potential of existing weather and water forecasts to improve San Bernardino Valley Municipal Water District's ability to recharge groundwater without compromising flood risk management outcomes for the U.S. Army Corps of Engineers (USACE).

Section 3.1 describes the framework used to objectively assess a selection of alternative Water Control Plans (WCPs). Currently, Seven Oaks Dam is regulated in accordance with the USACE 2003 Water Control Manual (WCM) (USACE LAD 2003). Figure 3-1 shows the simplified WCP, and the full WCP is shown in Appendix 3.1. Unlike traditional USACE WCPs, FIRO WCP alternatives leverage streamflow forecasts to inform release decisions. All WCPs (non-FIRO and FIRO) are subject to the same operational and physical constraints specified in the 2003 WCP. Each WCP alternative is evaluated with metrics representing flood risk management (FRM), water supply availability, and environmental outcomes. The coupled reservoir and downstream diversion model is described in Section 3.2. The process used to generate the streamflow forecasts and a description of the forecasts used to evaluate the WCP alternatives are provided in the simulation plan (Section 3.3).

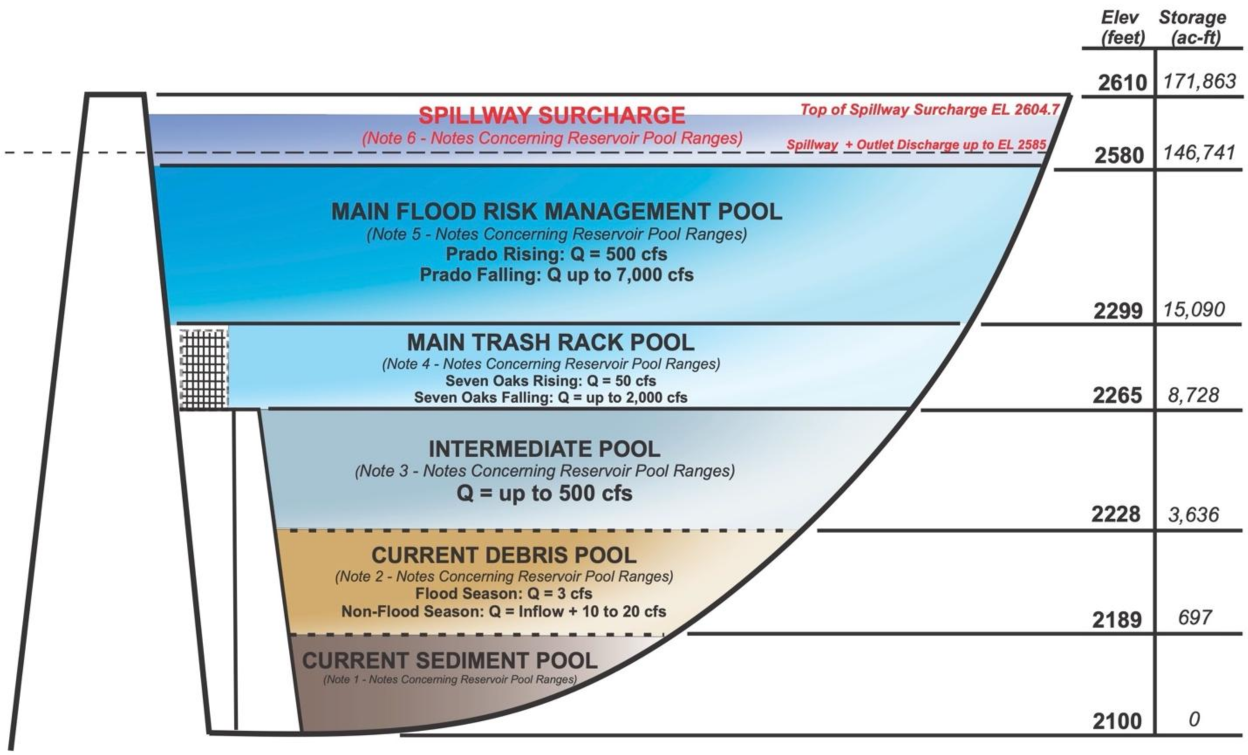

Figure 3-1. *Simplified WCP for Seven Oaks Dam (plate 7-01) (USACE LAD 2003). Pool elevations were updated by a survey completed in October 2025 (revised February 2026) by Orange County Public Works. (Storage values revised February 2026.) The Preliminary Viability Assessment (PVA) modeling took place before this survey. The elevations used in the PVA modeling for the top of sediment pool and debris pool were 2,190 feet and 2,220 feet, respectively. The full WCP is shown in Appendix 3.1.*

3.1 Evaluation Framework

The study team used an established USACE framework called a hydrologic engineering management plan (HEMP) to evaluate the effectiveness of WCP alternatives. The plan provides a systematic, defensible, and reproducible way to compare alternatives with the existing baseline and with one another. The full HEMP can be found in Appendix 3.2. This section provides a summary and describes adjustments made during the evaluation process.

3.1.1 System Constraints

The constraints for the modeling analysis are provided in Table 3-1. These are hard constraints that must be explicitly followed by each of the alternative WCPs.

Table 3-1. *Operational constraints that all FIRO alternatives must satisfy. Release units are in cubic feet per second (cfs).*

ID	Limiting Condition	Description
1	Must accommodate maximum release schedule	The maximum release schedule as defined in the USACE 2003 WCM.
2	Must meet instream minimum flow requirements	Minimum release set at 3 cfs.
3	Must satisfy limits on release rate of change	Limits on release rate of change are provided in the WCM for releases up to 7,000 cfs.
4	Must meet requirements for annual maintenance	All alternatives must draw down the reservoir to the top of the sediment pool (2,190 feet) as quickly as possible starting on August 1 for annual maintenance beginning on September 1.

The maximum release schedule detailed in the WCM (USACE LAD 2003) is a function of current pool elevation, downstream conditions at Prado Dam, and time of year. The maximum release schedule is summarized in Table 3-2. Releases from the debris pool are limited to 3 cfs during the flood season to build up and maintain the pool. Maximum releases from the intermediate pool are constrained by the release capability of the low-flow gate (500 cfs). Maximum releases from the trash rack pool depend on whether the water surface elevation (WSE) of Seven Oaks Dam is rising or falling. There are operational concerns with holding the WSE within the trash rack pool for extended periods of time due to potentially clogging the intake structure with debris floating on the pool's water surface.

Table 3-2. *Maximum release schedule at Seven Oaks Dam.*

Date	Debris Pool	Intermediate Pool	Trash Rack Pool	Flood Control Pool
Flood season (10/1–4/14)	3 cfs	500 cfs	Seven Oaks rising: 50 cfs Seven Oaks falling: 500–2,000 cfs	Prado rising: 500 cfs Prado falling: 2,000–7,000 cfs

Date	Debris Pool	Intermediate Pool	Trash Rack Pool	Flood Control Pool
Non-flood season (4/15–9/30)	500 cfs	500 cfs	Seven Oaks rising: 50 cfs Seven Oaks falling: 500–2,000 cfs	Prado rising: 500 cfs Prado falling: 2,000–7,000 cfs

The trash rack intake structure in relation to the dam is shown in Figure 3-2. When Seven Oaks Dam is rising and the WSE is within the trash rack pool, releases are limited to 50 cfs so the WSE can continue to rise without pulling in any floating debris into the intake structure. The intake structure clogging is primarily a concern when the WSE is rising. Releases from the trash rack pool when the WSE is falling vary from 500 cfs to 2,000 cfs and are a function of the Seven Oaks Dam WSE. When the WSE is within the flood control pool, releases are limited based on whether the Prado Dam WSE is rising or falling. If the Prado Dam WSE is rising, releases from Seven Oaks Dam are limited to 500 cfs to provide downstream flood control relief. Otherwise, releases vary from 2,000 cfs to 7,000 cfs depending on physical maximum release, which is a function of the Seven Oaks Dam WSE.

Figure 3-2. *Aerial photograph of Seven Oaks Dam and Reservoir. (Credit: Orange County Water District and EcoFlight.)*

The WRE team developed and simulated two configurations of operational constraints for this analysis to better understand the impacts of operations within the trash rack pool on groundwater recharge. The first configuration (C1) follows all the hard constraints outlined in Table 3-1. The second configuration (C2) ignores the maximum release schedule when the Seven Oaks Dam WSE is within the track rack pool and the WSE is rising. For C2, the maximum release within the trash rack pool is the physical outlet maximum (500–2,000 cfs) for both rising and falling conditions. It is important to note that C2 is not currently implementable at the Seven Oaks Dam. However, the simulation of C2 seeks to quantify any reductions in FIRO benefits for groundwater recharge due to current operational constraints that could potentially be addressed or removed with infrastructural changes in the future.

3.1.2 Operational Considerations and Performance Metrics

Table 3-3 provides the operational considerations for Seven Oaks Dam. These considerations establish the basis for the performance metrics used in this assessment.

Table 3-3. *Operational considerations evaluated by the alternatives.*

ID	Operational Consideration	Description
1	Meet downstream diversion capacity	Meet the downstream demand, which is the sum of the capacity of all diversion facilities.
2	Flows in excess of downstream diversion capacity	Water not recharged in the San Bernardino Basin Area, which is quantified to assess potential opportunities for recharge and to enhance habitat on the alluvial fan (AF).
3	Environmental impacts to downstream species	Releases that are not diverted can travel downstream, which is quantified for further assessment of potential benefits and impacts.
4	Emergency spillway flow	Emergency spillway releases raise dam safety concerns.

Table 3-4 shows the metrics evaluated for each WCP alternative. The development and modeling of the water supply availability and environmental metrics are described in more detail in Sections 5.6 and 5.7, respectively.

Table 3-4. *Performance metrics used for evaluation and comparison of the baseline WCM and proposed FIRO WCP alternatives.*

ID	Metric	Category	Method of Calculation
FRM-1	Annual maximum discharge frequency from Seven Oaks Dam	FRM	Frequency curve. Simulate 30-year hindcast period and extend with seven event-based simulations.
FRM-2	Annual maximum pool elevation frequency function of Seven Oaks Dam	FRM	Frequency curve. Simulate 30-year hindcast period and extend with seven event-based simulations.
WS-1	Annual diversion below Seven Oaks Dam to each facility (e.g. recharge basin)	Water supply availability	Net annual average. Simulate 30-year hindcast period.
WS-2	Annual release in excess of downstream diversion capacity (i.e., water not captured)	Water supply availability	Net annual average. Simulate 30-year hindcast period.
US-1	Number of days per year where inundation occurs above the following WSEs: 2,265 feet, 2,299 feet, 2,350 feet, and 2,400 feet	Environment	Days per year. Simulate 30-year hindcast period.
AF-1a	Number of days flow in the river at Alabama Street exceeds 100, 200, 300, 400, 500, 1,000, 1,500, 2,000, and 2,500 cfs in the river channel[a]	Environment	Days per year. Simulate 30-year hindcast period.
AF-1b	Number of times[b] flow in the river at Alabama Street exceeds 100, 200, 300, 400, 500, 1,000, 1,500, 2,000, and 2,500 cfs in the river channel[a]	Environment	Times[b] per year. Simulate 30-year hindcast period.
PS-1a	Number of days flow in the river at the perennial stream section exceeds 100, 200,	Environment	Days per year. Simulate 30-year hindcast period.

ID	Metric	Category	Method of Calculation
	300, 400, 500, 1000, 1,500, 2,000, and 2,500 cfs in the river channel[a]		
PS-1b	Number of times[b] flow in the river at the perennial stream section exceeds 100, 200, 300, 400, 500, 1,000, 1,500, 2,000, and 2,500 cfs[a]	Environment	Times[b] per year. Simulate 30-year hindcast period.

[a] After accounting for all downstream diversions.
[b] Number of unique occurrences (i.e., non-consecutive days).

FRM metrics pertain to Seven Oaks Dam releases and WSEs. There are no downstream flow control points that Seven Oaks Dam must consider. However, any releases that exceed 500 cfs trigger notifications for downstream interests (FRM-1). WSEs that result in discharging water through the emergency spillway (FRM-2) cause dam safety and long-term infrastructure concerns (e.g., erosion of spillway). Better performance is measured as minimizing downstream flows over 500 cfs (FRM-1) and minimizing use of the emergency spillway (FRM-2).

The water supply availability metrics measure the amount of water sent to the downstream diversion facilities for groundwater recharge and for storage in Metropolitan Water District of Southern California (MWDSC) reservoirs (WS-1). An additional water supply availability metric (WS-2) quantifies the amount of water not captured for recharge or for other uses in the San Bernardino Basin Area. This amount is defined as releases from Seven Oaks Dam that flow down the Santa Ana River past Alabama Street and exit the San Bernardino Basin Area before being diverted for recharge or storage. Better performance across FIRO alternatives is defined as maximizing WS-1 and minimizing WS-2.

The environmental work team developed environmental metrics to track model outputs and compare performance of the FIRO alternatives regarding environmental considerations. These metrics are not intended to assess environmental impacts nor quantify environmental benefits. The environmental metrics focus on three locations: one upstream of Seven Oaks Dam and two downstream of the dam on the Santa Ana River. The upstream metric (US-1) is based on the Seven Oaks Dam pool elevation. The first downstream location of interest is the alluvial fan, which is measured where Alabama Street crosses the Santa Ana River (AF-1a and AF-1b). The second downstream location is where water treatment plant effluent is discharged into the Santa Ana River near Rialto, California (PS-1a and PS-1b). While much of the Santa Ana River from the dam to just upstream of the treatment plant is ephemeral, effluent discharged by the treatment plant causes the section downstream of the treatment plant to be perennial. This reach is referred to as the perennial stream section of the Santa Ana River.

3.1.3 Reservoir Operations

The WRE team developed and simulated 17 alternatives for this study (Table 3-5), including 16 FIRO alternatives and one alternative capturing current operations under the WCM (USACE LAD 2003). Simulated outcomes under the existing WCM serve as a baseline with which to compare the performance of the simulated FIRO alternatives. This section summarizes operations under the WCM as well as the 16 FIRO alternatives.

Table 3-5. *WCP alternatives (16 FIRO and baseline WCM) simulated in the Seven Oaks Dam PVA.*

FIRO Space		Operating Strategy				
Elevation (feet)	% of Gross Storage	WCM	Summary Forecast Operations (SFO)	Ensemble Forecast Operations (EFO)	Weighted Forecast Release (WFR)	Model Predictive Control (MPC)
2,220	3%	WCM-2220	–	–	–	–
2,265	7%	–	SFO-2265	EFO-2265	WFR-2265	MPC-2265
2,299	11%	–	SFO-2299	EFO-2299	WFR-2299	MPC-2299
2,375	25%	–	SFO-2375	EFO-2375	WFR-2375	MPC-2375
2,418	35%	–	SFO-2418	EFO-2418	WFR-2418	MPC-2418

3.1.3.a WCM Operations

Orange County Public Works staff operate Seven Oaks Dam in accordance with the WCM (USACE LAD 2003), which is summarized in Figure 3-1. The only operating objective of the Seven Oaks Dam WCM is FRM. At the beginning of each flood season (October 1), releases are limited to a minimum flow (Table 3-2) to form the debris pool (2,220 feet). Once the debris pool is formed, releases generally follow the inflow up to the maximum release capability of the project (i.e., maximum release schedule) throughout the remainder of the flood season. When the storm season ends (April 15), the operational goal shifts to emptying the reservoir to the top of the sediment pool (2,190 feet) for annual maintenance. The drawdown begins directly after the storm season ends and must be completed by September 1 to allow time for maintenance work. Appendix 3.3 shows a table of the full release schedule prescribed by the WCM.

3.1.3.b FIRO Alternatives

A FIRO alternative is defined as the combination of reservoir operating strategy (i.e. FIRO strategy) and top of allowable storage (i.e. FIRO Space). A total of 16 FIRO alternatives were included for testing in this analysis. Releases prescribed from each FIRO alternative are limited by the operational constraints in Table 3-1. The FIRO alternatives also include an additional minimum release rule for downstream demand. The downstream demand rule is the sum of the diversion capacity of all the downstream facilities, described in Section 3.2.1. This rule ensures that if there is available water in the reservoir storage and releases are not constrained by a higher priority rule, then the downstream demand will be released instead of being stored within the reservoir. The FIRO strategies and FIRO Spaces are described in more detail below.

<u>FIRO Strategies</u>

The WRE team modeled four FIRO operating strategies for simulation in this study: SFO, EFO, WFR, and MPC. Each strategy receives identical ensemble streamflow forecast information as input. However, the method to transform forecast information to release decisions varies for each strategy, which results in different prescribed releases. The strategies are summarized below with more details in the corresponding appendices.

1) Summary Forecast Operations

SFO, formerly Simpler Forecast Operations, was developed by the USACE Hydrologic Engineering Center for testing during the Prado Dam Final Viability Assessment (FVA) (Ralph et al. 2023). SFO leverages a time-varying percentile of the forecasted cumulative inflow volume over a five-day forecast horizon and a target storage threshold to calculate releases.

For a given forecast, a release with the SFO strategy is calculated as follows:

1. Retrieve ensemble forecast of reservoir inflows. Use five-day forecast horizon.
2. Calculate cumulative inflow volume for each ensemble member at each lead time.
3. Take the *nth* percentile of cumulative inflow for each lead time. The percentile is a function of the initial reservoir WSE.
4. Calculate excess volume over target storage (e.g., top of FIRO Space, spillway crest) to release.
5. Normalize each release by the corresponding lead time.
6. Set maximum as release.

More detail on the SFO strategy and parameterization is provided in Appendix 3.4.1 and in Section 4.2.1 of the Prado Dam FVA.

2) Ensemble Forecast Operations

EFO is a methodology that determines flood control releases based on a probability index curve, formerly risk tolerance curve (Delaney et al. 2020), which is calibrated to balance FRM and water supply availability at Seven Oaks Dam. EFO has been evaluated as a FIRO strategy in previous viability assessments including the Lake Mendocino FVA (Jasperse et al. 2020), Prado Dam FVA (Ralph et al. 2023), and Yuba-Feather FVA (Ralph et al. 2025). EFO prescribes a release schedule using all ensemble members, to ensure the full range of uncertainty is considered, and a key assumption here is that all ensemble members are equally likely. Physical and operational constraints are considered in estimating EFO-prescribed flood control releases, which allows EFO to adapt to future limitations caused by such constraints. For example, if releases at a future time step are expected to be constrained, EFO can use this information to adapt and release more at the current timestep to account for future constraints.

For a given forecast, the process to calculate a release with the EFO strategy is as follows:

1. Retrieve the ensemble forecast of reservoir inflows. Use a 14-day forecast horizon.
2. Calculate the cumulative inflow volume for each ensemble member over forecast horizon.
3. Count the number of ensemble members that exceed target storage (i.e. top of FIRO Space) at each lead-time.
4. Compare the number of exceeding members to the probability index curve (calibrated parameter set).
5. Calculate the maximum volume to release to satisfy the probability index curve at each lead time.
6. Normalize each release by the corresponding lead time.
7. Set the maximum value as the release.

More detail on the EFO strategy is provided in Appendix 3.4.2 and in Delaney et al. (2020). Details on calibrating the probability index curve are available in Appendix 3.4.3.

3) Weighted Forecast Release

WFR is a flood control strategy that uses a non-exceedance percentile of the ensemble inflow forecast and lead time–specific release weights to calculate flood control releases. The WRE team selected and calibrated the non-exceedance percentile and lead time–specific release weights for this study to maximize system performance. The release weights decrease as lead time increases because forecast uncertainty increases with lead time, which can result in unnecessarily large flood control releases. Smaller weights for longer lead times act as a countermeasure against over forecasts of reservoir inflows. Physical and operational constraints are considered by the strategy in estimating the release schedule, which allows WFR to adapt and react to potential future release constraints. In such cases, WFR uses this information to adjust the release schedule accordingly.

For a given forecast, the process to calculate a release with the WFR strategy is as follows:

1. Retrieve the ensemble forecast of reservoir inflows. Use a 14-day forecast horizon.
2. Calculate the cumulative inflow volume for each ensemble member.
3. Take the *nth* percentile of cumulative inflow for each lead time.
4. Calculate the excess volume over the target storage (i.e., top of FIRO Space) to release.
5. Normalize each release by lead time.
6. Adjust the normalized value by the corresponding release weights (calibrated parameter set) for each lead time.
7. Set the maximum value as the release.

More detail on the WFR strategy is provided in Appendix 3.4.4 and in Erfani et al. (*in preparation*). Details on the calibration of the release weights are available in Appendix 3.4.3.

4) Model Predictive Control

MPC is a control technique that optimizes releases at each decision time step (i.e., daily) by simulating system performance over a forecast horizon (Castelletti et al. 2023). MPC is an online control strategy, meaning that it reoptimizes the release sequence for each new forecast issuance. Traditional MPC approaches leverage single-value forecasts. However, newer MPC methods have emerged to leverage ensemble forecasts in decision making, such as tree-based MPC (Raso et al. 2013, 2014; Schwanenberg et al. 2015; Uysal et al. 2018). This study develops and evaluates tree-based MPC as a FIRO strategy. Tree-based MPC leverages forecast information via a scenario tree that is generated from the individual ensemble members. For computational efficiency, the original ensemble undergoes scenario reduction to reduce dimensionality (Growe-Kuska et al. 2003). Scenario reduction decreases redundant information present in similar ensemble members, often near the projected mean, while preserving the spread of the original ensemble members. This process also preserves the probability distribution of the original ensemble members.

For a given forecast, the process to calculate a release with the MPC strategy is as follows:

1. Retrieve the ensemble forecast of reservoir inflows. Use a 14-day forecast horizon.
2. Perform a scenario reduction on the ensemble.

3. Generate a scenario tree from the reduced ensemble.
4. Optimize releases over each branch of the scenario tree to minimize exceeding the top of the FIRO Space and minimize water not captured (WS-2).
5. Select the release sequence that best balances flood control and water supply, subject to selection criteria (calibrated parameter set). Selection criteria is a function of initial WSE and forecasted storage.
6. Set the first release in the selected sequence.

More detail on the MPC strategy is provided in Appendix 3.4.5 and Semmendinger-Raney et al. (*in preparation*). Details on the selection criteria development are available in Appendix 3.4.6.

FIRO Spaces

The FIRO team selected four FIRO Spaces at Seven Oaks Dam for this study: 2,265 feet, 2,299 feet, 2,375 feet, and 2,418 feet, as shown in Figure 3-3. The two lower FIRO Spaces correspond with the top of intermediate pool (2,265 feet) and top of trash rack pool (2,299 feet), and the two higher FIRO Spaces are located within the main flood control pool (2,375 and 2,418 feet). Table 3-5 shows the percentage of gross storage for each FIRO Space. The selection of the four FIRO Spaces was informed by a water conservation feasibility study conducted by USACE in 1997 (USACE LAD 1997). However, the feasibility study was neither finalized nor approved for implementation at Seven Oaks Dam. The two FIRO Spaces located within the main flood control pool (2,375 feet and 2,418 feet) are modeled in this PVA as exploratory FIRO Spaces to test the robustness of Seven Oaks Dam and stress test its system. The inclusion of these two FIRO Spaces is meant to evaluate at what elevation FRM outcomes degrade, which helps promote a better understanding of the system dynamics.

The FIRO Spaces follow the same temporal fill and drawdown pattern as the operational WCM guide curve, as shown in Figure 3-3. During the flood season, the target storage of Seven Oaks Dam is set to the top of the FIRO Space. The FIRO strategies calculate a release when the Seven Oaks Dam WSE exceeds (or is forecasted to exceed) the top of FIRO Space elevation. At the end of flood season, the FIRO Spaces are drained, typically at a rate of downstream diversion capacity, to empty the reservoir to an elevation of 2,190 feet for annual maintenance by September 1. The reservoir remains empty (i.e., outflows are equal to inflows) for the rest of September for maintenance purposes before the flood season begins.

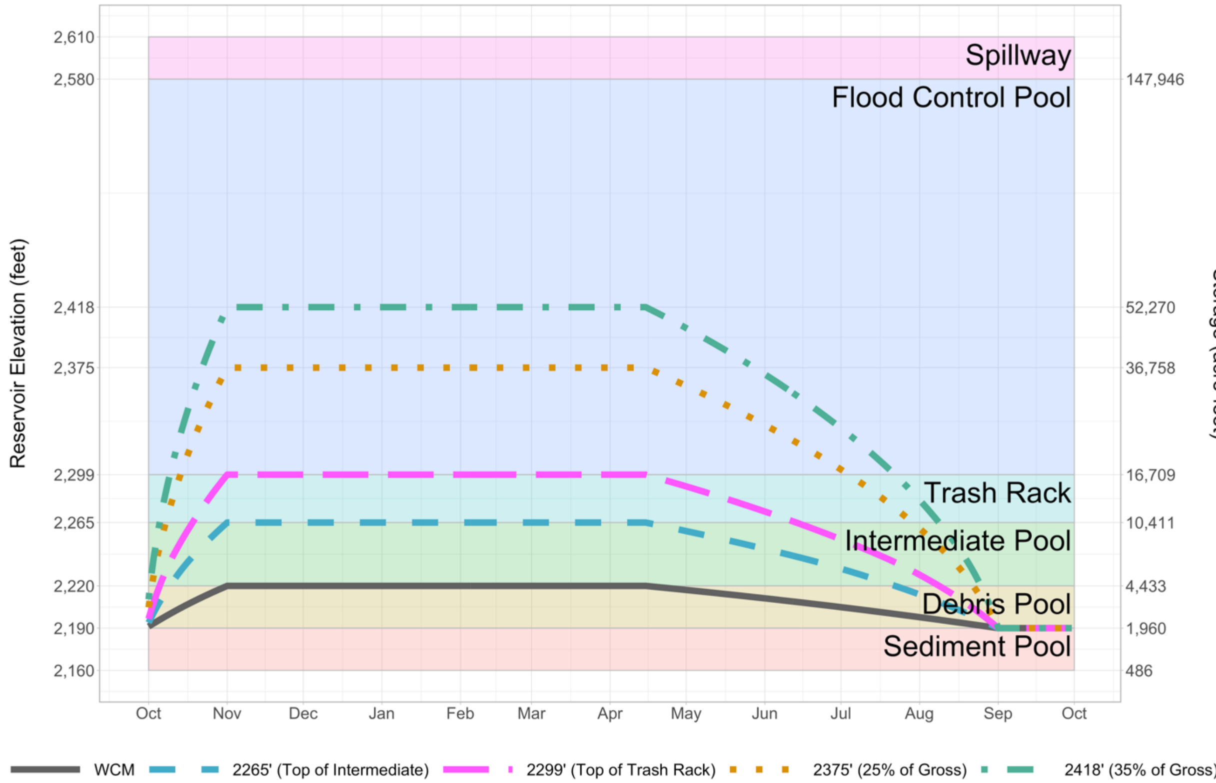

Figure 3-3. *The operational WCM guide curve and the four simulated tops of FIRO Spaces (2,265 feet, 2,299 feet, 2,375 feet, and 2,418 feet) assessed in the Seven Oaks Dam PVA.*

3.2 System Modeling Plan

The WRE team developed a network model to simulate coupled reservoir and groundwater operations. Ideally, reservoir releases are made at a rate that can be fully diverted for groundwater recharge or municipal use. However, there are times when more releases than downstream demand are needed for FRM or for annual maintenance. This section describes the development of a system network model for Seven Oaks Dam and the integrated downstream demand modeling that guides releases associated with water supply use.

3.2.1 Network Model

The simulation framework foundation is a network model that is consistent across FIRO alternatives and the baseline WCM. Figure 3-4 shows a schematic of the network model. Observed and forecasted reservoir inflows for FIRO alternatives are used to calculate a release from Seven Oaks Dam, which differs between FIRO alternatives. The release is routed to the downstream point of diversion, the Cuttle Weir. From there, flows can be diverted to the Santa Ana River spreading grounds (SARSG), Mill Creek spreading grounds (MCSG), San Bernardino County flood control basins (SBCFCB), and/or MWDSC reservoirs. Additionally, flows can continue down the Santa Ana River for percolation along the main river channel. The recharge capacity (or the conveyance capacity) across these locations is summed to calculate the release for downstream demand. The downstream diversion facilities and allocation scheme are described in more detail in Section 5.6.

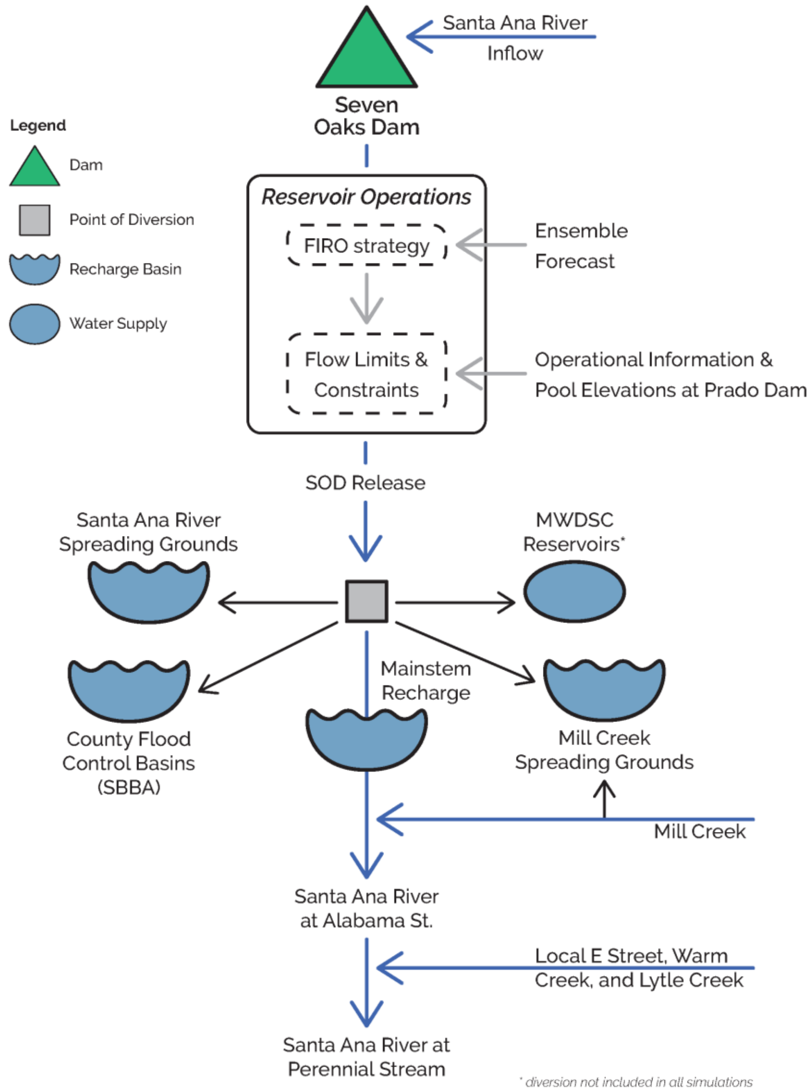

Figure 3-4. *Network model schematic of Seven Oaks Dam and downstream diversion points.*

3.2.1.a Network Scenarios for Evaluation

The FIRO team configured two scenarios in the network model for this study. The first scenario (S1) includes diversions to SARSG, MCSG, SBCFCB, and the Santa Ana River channel. The second scenario (S2) has all the diversions from S1 and includes an additional diversion to MWDSC reservoirs. S1 serves as the default network for analysis. The joint water right between San Bernardino Valley and Western Water permits up to 198,000 acre-feet (ac-ft) per year of diversions to and storage in the MWDSC reservoirs. Western Water requested the FIRO modeling be consistent with the permit language, and thus diversions to MWDSC reservoirs are included as a series of explorative simulations and will be evaluated in the FVA. Diversions to MWDSC reservoirs are not currently operational due to a lack of institutional and infrastructural agreements. However, Western Water is initiating discussions MWDSC to develop the required agreements to divert to MWDSC reservoirs as demonstrated in S2. S2 seeks to quantify how much water could potentially be diverted to MWDSC reservoirs under FIRO operations.

3.3 Simulation Plan

The simulation plan defines and provides the observations and forecasts needed to simulate reservoir operations for each WCP alternative in Table 3-5. This study includes two types of simulations: (1) a 30-year continuous simulation and (2) seven event-based simulations. The two simulation types within the simulation plan are summarized in Table 3-6 and further described in Sections 3.3.1 and 3.3.2, respectively.

Table 3-6. *Simulation plan for each WCP alternative.*

Simulation Type	Continuous			Event-based	
Simulation Period	30-year period of record (POR)			Six historical events	Reservoir design flood
Constraint Configuration / Network Scenario	C1/S1	C1/S2	C2/S1	C1/S1	C1/S1

3.3.1 Continuous POR Simulation

A continuous POR of coupled reservoir and groundwater operations was simulated from October 1, 1990, to September 30, 2019. The input datasets (Section 3.3.1.a) and modeling assumptions (Section 3.3.1.b) for the POR simulation are described below.

3.3.1.a Hydrologic Inputs

Several input hydrologic datasets are needed to run the reservoir and groundwater operations model. The datasets used in the 30-year POR simulation are:

- Observed reservoir inflows.
    - Reservoir inflows were compiled from two datasets. The pre-dam period uses Santa Ana River streamflow observations from U.S. Geological Survey (USGS) gage #11051501 (i.e., natural flows). The post-dam period uses inflows calculated with historical pool elevations and release records. For more information, see Section 5.5.2.a.
- Ensemble forecast of reservoir inflows.
    - Historical ensemble forecasts (i.e., hindcasts) were generated for the National Weather Service's Hydrologic Ensemble Forecast System (HEFS). HEFS hindcasts are inputs to the FIRO alternatives that inform flood control releases. HEFS hindcasts are available from October 1, 1990, to September 30, 2019. For more information, see Section 5.5.2.b.
- Mill Creek streamflow.
    - Observed streamflow at Mill Creek is from USGS gage #11055000.
- Santa Ana River downstream tributary streamflow contributions.
    - Simulated flows using the California Nevada River Forecast Center's hydrologic model are used for local flows at E Street (with the Mill Creek contribution removed). Additional tributary flows for Warm Creek and Lytle Creek use observed streamflow from USGS gage nos. 11060400 and 11065000. See Appendix 3.5 for more detail.
- Prado Dam pool elevations.

- Prado Dam WSE is needed to determine the maximum flood control release from Seven Oaks Dam. The dataset used for Prado Dam WSE is from the Prado Dam FVA (Ralph et al. 2023) for the simulated EFO alternative with a 508-foot buffer pool.

3.3.1.b Model Setup

Each WCP alternative started with the same initial condition (an initial reservoir elevation of 2,190 feet) and was simulated for the 30-year POR. Releases from Seven Oaks Dam are modeled based on the input hydrology described above for each FIRO alternative. The release is then diverted to the downstream facilities described in Section 3.2.1. Any water that is not diverted is routed downstream along the Santa Ana River.

For the historical simulation, the WRE team modeled three combinations of constraint configurations (C1 and C2) and network scenarios (S1 and S2): C1/S1, C1/S2, and C2/S1. Note that C2/S2 was not simulated since both the operational constraint configuration and baseline network scenario are changed, which would not provide results for the isolated effects of C2 and S2. The FIRO alternatives are evaluated based on the FRM, water supply, and environmental metrics described in Table 3-4.

3.3.2 Event-Based Simulation

Outside of the POR, the WRE team simulated an additional seven flood events. Six historical events outside of the POR (pre-1990) and the synthetically generated reservoir design flood (RDF) were simulated to provide a more robust analysis for FRM outcomes. Table 3-7 shows the seven events, estimated return periods, and critical inflow volumes. See Section 5.5 for more detail on the flow frequency analysis. The input datasets and modeling setup for the six historical events and RDF event are described in the following subsections.

The historical flood events were selected based on the events with the highest two-day critical duration volume. For Seven Oaks Dam, the hydrology team identified the two-day inflow volume as the critical duration, which also aligns with the critical volume that was used in the Prado Dam FVA (Ralph et al. 2023).

Table 3-7. *Details for the event-based simulations for six historical and one synthetic floods.*

Event	Type	Estimated Return Period	Maximum Cumulative Two-Day Inflow Volume (ac-ft)
January 27, 1916	Historical	75-year	38,678
March 2, 1938	Historical	100-year	46,770
December 6, 1966	Historical	25-year	18,129
January 25, 1969	Historical	25-year	13,587
February 25, 1969	Historical	25-year	17,256
February 21, 1980	Historical	15-year	13,428
RDF	Synthetic	350-year	99,828

The RDF is the maximum flood that the reservoir was originally designed to control under assumed conditions of operation according to the WCM. The RDF is based on a scaled standard project flood, which "represents the flood that would result from the most severe combination of meteorologic and hydrologic conditions considered reasonably characteristic of the geographical area" (USACE LAD 2003). The RDF was scaled up from the standard project flood based on a benefit-cost analysis to determine the optimal level of protection. More details on how USACE developed the standard project flood and RDF are available in the WCM (USACE LAD 2003; Section 8. pp. 1–3).

3.3.2.a Hydrologic Inputs

Several input hydrologic datasets are needed to run the reservoir and groundwater recharge operations model for each event-based simulation. The datasets used in the event-based simulations are:

- Observed reservoir inflows.
    - Historical: Observed streamflow from USGS gage #11051501 (i.e., natural Santa Ana River flow).
    - RDF: The RDF event uses an inflow trace included in the WCM (USACE LAD 2003; Plate 8-02). The five-day trace was digitized and expanded using average wintertime baseflow conditions.
- Ensemble forecast of reservoir inflows.
    - HEFS hindcasts were not available for the event-based simulations. The FIRO team used a methodology developed in Brodeur et al. (2024, 2025) to generate synthetic streamflow forecasts that emulate the current HEFS forecast skill for periods that fall outside of the POR. Since these synthetically generated ensemble forecasts are stochastic by nature, a total of 100 random forecast sets were generated and used as input to the FIRO alternatives for each event. The reservoir outcomes presented in the following section are shown as distributions of outcomes across the 100 randomly generated samples. More details and the verification metrics for the synthetic forecasts are available in Appendix 3.6.
- Prado Dam pool elevations.
    - Prado Dam WSEs are assumed to begin rising four days before peak inflows through two days after peak inflows.

Note that Mill Creek streamflow and Santa Ana River downstream tributary streamflow contributions are not applicable in the event-based simulation because the network does not model downstream conditions.

3.3.2.b Model Setup

Each simulation starts 15 days before peak inflows and ends 15 days after peak inflows. Simulations for each alternative are started with a reservoir elevation at the corresponding top of FIRO Space in order to capture how holding water at the top of each FIRO Space impacts FRM outcomes. Downstream diversions are not modeled for the flood event simulations, so the simulations do not include the downstream demand rule for minimum release (described in Section 3.1.3.b). The event-based simulations track Seven Oaks Dam releases and WSE to measure FRM-1 and FRM-2 from Table 3-4.

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Section 4. Assessment Results

This section presents the simulation results of the 16 Forecast Informed Reservoir Operations (FIRO) alternatives and baseline Water Control Manual (WCM) (USACE LAD 2003) using the evaluation framework presented in Section 3. The 17 Water Control Plan (WCP) alternatives (16 FIRO alternatives and baseline WCM) are shown in Table 3-5. The results for the 30-year period of record (POR) simulation and seven event-based simulations for the metrics outlined in Table 3-4 are described in Section 4.1.

The goals of this assessment were to:

- Refine the process through which FIRO alternatives could be simulated and evaluated for the Final Viability Assessment (FVA).
- Gain insight on the viability of FIRO for Seven Oaks Dam.
- Gain insight on the type of WCP alternatives that should be evaluated for the FVA.

As such, the analysis and results shown are not intended to yield a recommendation for a specific FIRO WCP alternative for Seven Oaks Dam. Instead, they provide information for a follow-up study that will include an implementation recommendation.

The simulations and assessments performed generated significant insight into the viability of FIRO at Seven Oaks Dam. The results shown in Section 4.1 indicate that FIRO is viable at Seven Oaks Dam. Overall, the 2,265-foot (top of intermediate pool) and 2,299-foot (top of trash rack pool) FIRO Spaces improve water supply availability without compromising flood risk management (FRM) outcomes. The potential impacts to environmental metrics and water quality outcomes need further examination.

The key findings for this analysis are:

- There are no FRM impacts for FIRO alternatives tested against historically observed event simulations (30-year POR and six historical flood events).
- Alternatives with FIRO Spaces of 2,265 feet or 2,299 feet (slightly higher winter storage levels than current operations) result in similar FRM compared WCM operations (2,220 feet) when simulated with inflows from the reservoir design flood (RDF).
- Alternatives with higher FIRO Spaces of 2,375 feet or 2,418 feet could incur additional risk against unobserved, but plausible, exceptionally extreme flood events, as shown in the RDF simulation.
- Differences in recharge outcomes across FIRO alternatives are attributable to the top of FIRO Space rather than the FIRO strategy. Higher winter storage, especially in wet years, increases the amount of water available for recharge.
- Indicators to explore potential environmental changes showed little variation in between FIRO alternatives and WCM operations for downstream flow conditions.

4.1 Simulation Results

The simulation results for each WCP alternative, constraint configuration (C1 and C2), and network scenario (S1 and S2) support the evaluation of impacts to flood risk management, water supply, and environmental metrics. The FIRO alternatives are described in Table 3-5, and the performance metrics are described in Table 3-4. The results are presented below by FRM

(Section 4.1.1), water supply (Section 4.1.2), and environmental (Section 4.1.3) metric performance. Additional results and figures are in the corresponding appendices.

4.1.1 FRM Metrics

Results are based on the POR simulations (1990–2019) and seven flood-event simulations (six pre-1990 flood events and the RDF event). The inclusion of specific flood events in the simulation plan serves to provide more robust tests for FRM outcomes. This section will present flood frequency curves that include the seven flood event simulations with the 30-year POR results. These results are based on the C1 constraint configuration (operational trash rack flow constraint). The event-based simulations do not simulate downstream conditions of Seven Oaks Dam (see Section 3.3.2.b), and the POR simulation is based on the S1 network scenario (without Metropolitan Water District of Southern California [MWDSC] diversion).

4.1.1.a Aggregated Annual Exceedance Probability Analysis

The annual exceedance probabilities of Seven Oaks Dam water surface elevations (WSEs) are shown in Figure 4-1, and the annual exceedance probabilities of Seven Oaks Dam releases are shown in Appendix 4.1, Figure 4-1. Note that the flood event simulations (six historical flood events and the RDF event) use the synthetically generated ensemble forecasts described in Section 3.3.2. A total of 100 randomly generated synthetic forecast sets were used to ensure the results were not overly sensitive to a particular forecast sample. Figure 4-1 and Appendix 4.1 show the average WSEs and releases that occur across the 100 random forecast samples that were simulated.

The expected maximum annual WSEs and releases are similar between WCM operations and FIRO alternatives with the 2,265-foot and 2,299-foot FIRO Spaces. FIRO alternatives with 2,375-foot and 2,418-foot FIRO Spaces produce higher maximum annual releases and WSEs than the baseline WCM operations. The RDF event simulation produced the highest release and WSE of all FIRO alternatives. The next six highest releases and WSEs produced for all FIRO alternatives were results of the six historical event simulations. Inflows over the 30-year POR were fairly small in terms of the full observational record (1912–present). The annual maxima over the POR did not test the ability of FIRO alternatives to navigate FRM.

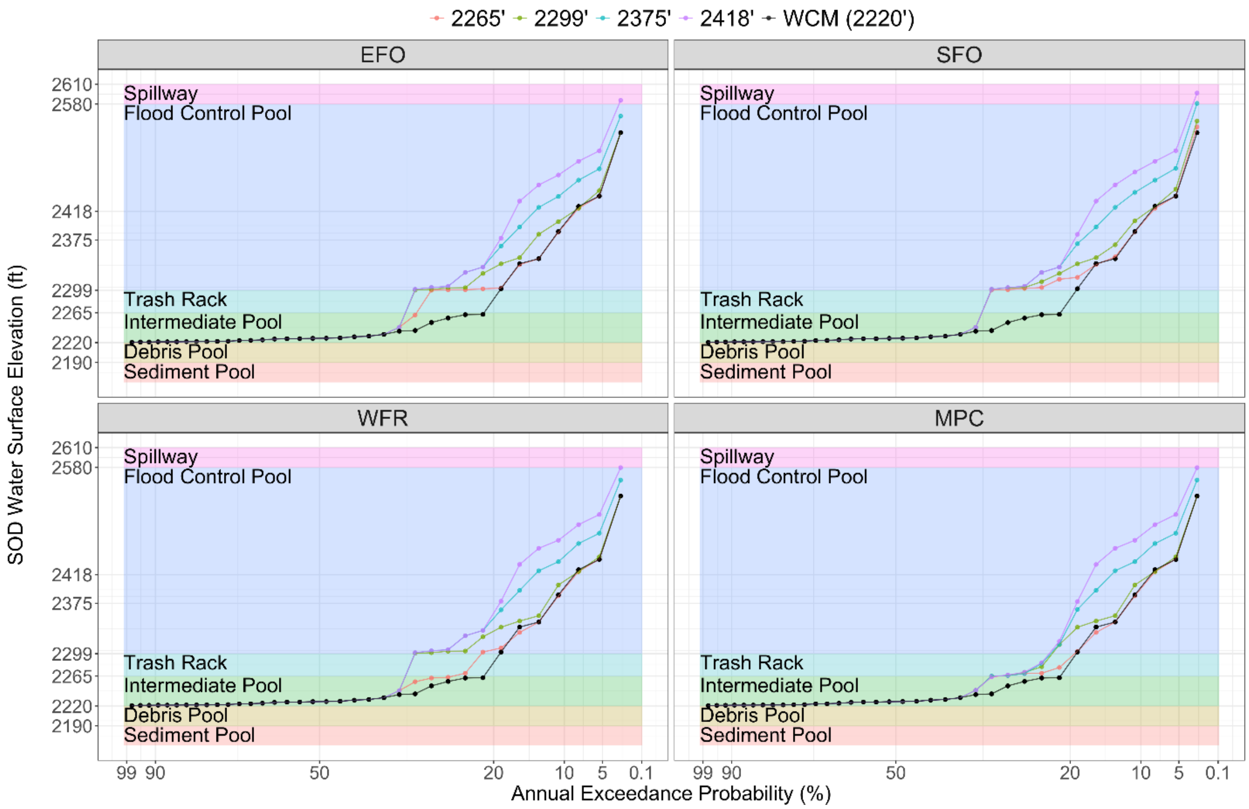

Figure 4-1. *Annual exceedance probability for Seven Oaks Dam WSEs based on the 16 FIRO alternatives and baseline WCM. Results are categorized by FIRO strategy. The lines in the faceted plots are colored by FIRO Space. Baseline WCM WSEs are included for comparison as the solid black line in each facet. The shaded background regions of each plot show the five reservoir pool areas and the emergency spillway.*

4.1.1.b Reservoir Design Flood Event Analysis

The RDF simulation was the only simulated event that triggered emergency spillway releases for any FIRO alternative. Since flood control is the primary operating objective of Seven Oaks Dam, FIRO alternatives must not result in worse FRM outcomes than those of the baseline WCM. The simulated WSEs for the RDF event are shown in Figure 4-2. The results show the distribution of WSE outcomes for each FIRO alternative across the 100 random forecast samples simulated.

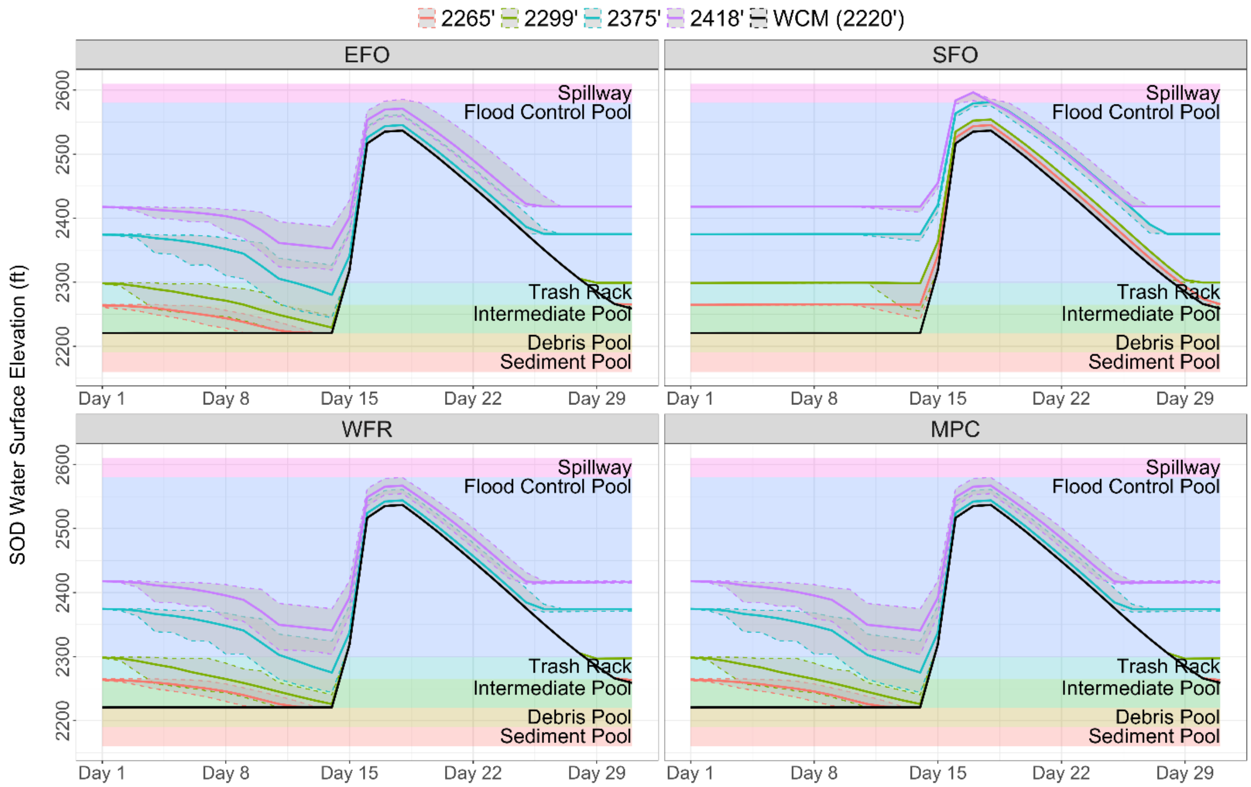

Figure 4-2. *The distribution of WSEs for the RDF event simulation for the 100 forecast samples. Results are categorized by FIRO strategy. Lines are colored by the corresponding FIRO Space. The solid line shows the average WSE, and the dashed lines show the minimum and maximum WSEs at each time step. The solid black line on each plot is the baseline WCM WSE time series. The shaded background regions show the five reservoir pool areas and the emergency spillway.*

FRM outcomes are sensitive to the top of FIRO Space. No FIRO alternatives with a FIRO Space of 2,266 feet or 2,299 feet resulted in spillway releases for any FIRO strategy. Furthermore, the maximum simulated WSEs for the 2,266-foot and 2,299-foot FIRO Spaces were the same as the baseline WCM for three FIRO strategies (Ensemble Forecast Operations [EFO], Weighted Forecast Release [WFR], and Model Predictive Control [MPC]). Only the Summary Forecast Operations (SFO) strategy produced larger peak WSEs for the 2,266-foot and 2,299-foot FIRO Spaces.

Results for FRM outcomes were more varied at the 2,375-foot and 2,418-foot FIRO Spaces. All FIRO alternatives with the 2,375-foot and 2,418-foot FIRO Spaces produced larger peak WSEs than the baseline WCM. A total of four FIRO alternatives resulted in use of the emergency spillway, one with a 2,375-foot FIRO Space and three with a 2,418-foot FIRO Space (SFO-2375, SFO-2418, EFO-2418, and MPC-2418). SFO-2375 had 98 of 100 forecast samples reach the emergency spillway. SFO-2418 had 100 of 100 forecast samples reach the emergency spillway. EFO-2418 had five of 100 forecast samples reach the emergency spillway. MPC-2418 had one of 100 forecast samples reach the emergency spillway. No WFR alternatives resulted in use of the emergency spillway.

The variability in WSE outcomes across the 100 random forecast samples for the SFO strategy is much smaller than for other FIRO strategies. This is likely due to the shortened forecast horizon (i.e., five days) that SFO uses to prescribe flood control releases. Prado Dam pool elevations were assumed to begin rising four days prior to peak inflows (see Section 3.3.2.b), which limits releases from Seven Oaks Dam to 500 cubic feet per second (cfs). Therefore, the ability of SFO to pre-release prior to peak inflows is limited to the fifth day before peak inflows. This differs from the EFO, WFR, and MPC strategies, which use a forecast horizon of 14 days, so pre-releases can occur before releases are constrained for downstream flood control at Prado Dam.

Overall, these results indicate that storing water at 2,265 feet and 2,299 feet has little to no impact on FRM outcomes (maximum release and peak WSE). Based on the results from this study, storing water at 2,375 feet and 2,418 feet may increase expected FRM outcomes for events of RDF or larger. Exploring FIRO Spaces between 2,299 feet and 2,375 feet is recommended for the FVA to better assess the FIRO Space elevation at which FRM outcomes begin to degrade for exceptionally extreme events.

4.1.2 Water Supply Availability Metrics

The results described below are based on the 30-year POR simulation for each FIRO alternative for the C1 constraint configuration and S1 network scenario unless otherwise noted. The net annual average recharge summed at all downstream facilities and the net annual average water not captured for the 16 FIRO alternatives over the 30-year POR are shown in Figure 4-3. Better performance for a FIRO alternative is defined as higher values for water recharged and lower values for water not captured. The net annual average recharge at individual recharge facilities for each FIRO alternative is shown in Appendix 4.2.

There is minimal variation in water recharged (Figure 4-3a) and water not captured (Figure 4-3b) for the same FIRO Space across the four FIRO strategies. However, the performance of water supply availability metrics is much more sensitive to the top of FIRO Space elevation. Generally, as the top of FIRO Space increases, the performance for the water supply availability metrics also increases (i.e., groundwater recharge increases and water not captured decreases).

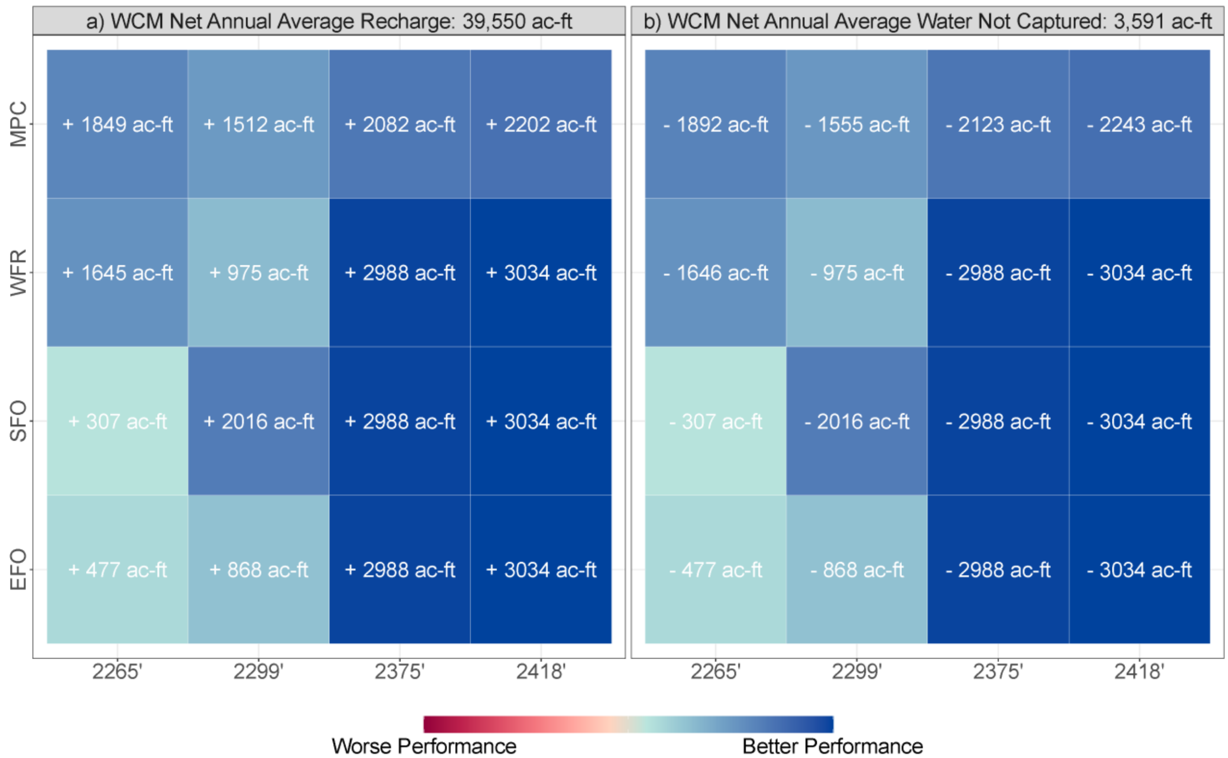

Figure 4-3. *Improvement in net annual average a) groundwater recharge and b) water not captured for the 16 FIRO alternatives compared to baseline WCM operations for the 30-year POR simulation. FIRO alternatives are arranged by FIRO strategy (rows) and FIRO Space (columns). Tiles are shaded by performance where darker blue corresponds to better performance (i.e., higher recharge values and lower values of water not captured).*

While the FIRO alternatives improve water supply availability outcomes compared to baseline WCM operations, the magnitude of water supply benefits varies from year to year. Figure 4-4 shows the total recharge by water year for each year in the POR (1990–2019). In 24 out of 30 years (80 percent), recharge outcomes for the 16 FIRO alternatives were the same as the baseline recharge. The six years (20 percent) where FIRO alternatives outperformed the baseline WCM had higher than average inflows (i.e., wet years). This indicates that in average or drier than average years, there is not enough inflow to the reservoir for FIRO alternatives to store more water during the flood season. FIRO benefits are greatest in wet years when FIRO alternatives can temporarily store more water in the reservoir that would otherwise be immediately released under baseline WCM operations. The water stored in the reservoir under FIRO operations is then released post-event at a rate corresponding to the capture capacity of downstream facilities.

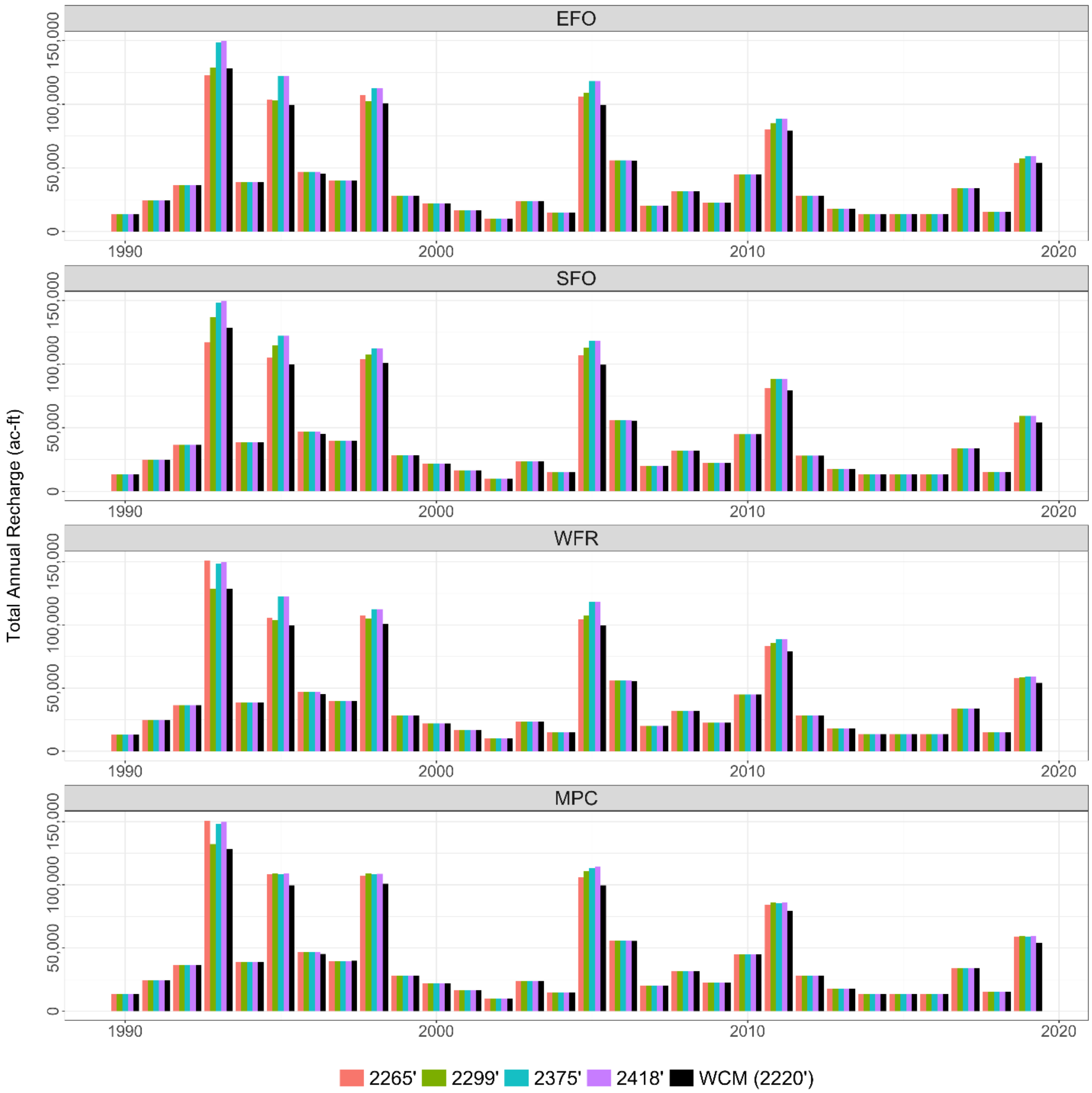

Figure 4-4. *Total annual recharge for each water year in the 30-year POR. Results are categorized by FIRO strategy, and the bars in the faceted plots are colored by FIRO Space. Baseline WCM releases are included for comparison as the solid black bar in each facet.*

4.1.2.a Impacts of Trash Rack Operations on Water Supply Outcomes

The two constraint configurations (C1 and C2) were run for the S1 network scenario to quantify the impacts of the trash rack constraint on water supply metrics. The total recharge for the 30-year POR between the two constraint configurations and their difference for the four FIRO Spaces with the EFO FIRO strategy are shown in Table 4-1. While only results for the EFO control strategy are shown, results are similar for the other three FIRO strategies. At the two lower FIRO Spaces (2,265 feet and 2,299 feet), trash rack operations result in a reduction of groundwater recharge. However, at the two higher FIRO Spaces (2,375 feet and 2,418 feet), trash rack operations have little impact on recharge. The reduction in recharge at the 2,265-foot and 2,299-foot FIRO Spaces is due to their increased frequency of entering the trash rack pool compared to the 2,375-foot and 2,418-foot FIRO Spaces. Once the 2,375-foot and 2,418-foot FIRO Spaces rise above the trash rack pool, the WSE often does not fall back into the trash rack pool until the late summer drawdown. The 2,265-foot and 2,299-foot FIRO Spaces enter the trash rack pool more frequently, albeit in slightly different ways.

During periods of increased inflows, the 2,265-foot alternatives may pre-release water to make room for forecasted inflows. However, if not enough water is released, the WSE will rise above the top of FIRO Space and enter the trash rack. Once the WSE enters the trash rack, releases are limited to 50 cfs, which causes the WSE to quickly rise above the trash rack. Then, once peak inflows have passed, the 2,265-foot alternatives prescribe releases exceeding downstream recharge capacity to bring the WSE back down to the top of FIRO Space as quickly as possible.

The 2,299-foot alternatives behave differently since the top of FIRO Space corresponds with the top of the trash rack pool. To pre-release water, the WSE of 2,299-foot alternatives must dip down into the trash rack pool. However, as soon as the WSE enters the trash rack pool, releases are limited to 50 cfs to bring the WSE back up to 2,299 feet. Then, when peak inflows enter the reservoir, the WSE rises above the top of FIRO Space, and the 2,299-foot alternatives prescribe releases to bring the WSE back down to the top of FIRO Space as quickly as possible. These releases often exceed downstream recharge capacity. Generally put, the 2,299-foot alternatives cannot pre-release water based on the forecasted inflows given the operational trash rack constraints.

Table 4-1. *Total recharge over the POR for the EFO FIRO strategy for the two simulated constraint configurations, shown in acre-feet (ac-ft). The C1 configuration (second column) includes the operational trash rack release constraint, and the C2 configuration (third column) does not include the operational trash track release constraints. The difference in groundwater recharge between C1 and C2 is shown in the fourth column.*

FIRO Alternative	C1 Recharge (ac-ft)	C2 Recharge (ac-ft)	Difference (C2 – C1)
EFO-2265	605,409	617,218	11,809
EFO-2299	611,314	629,256	17,942
EFO-2375	643,383	644,772	1,389
EFO-2418	644,072	645,461	1,389

The C2 constraint configuration was included for simulation in the Preliminary Viability Assessment (PVA) to investigate whether current trash rack operations have any impact on water supply availability metrics. These preliminary simulation results indicate that current trash rack operations may result in a lost opportunity to recharge water within the SBBA due to releases that exceed downstream diversion capacity. The FVA should further refine this evaluation process to better understand more granular impacts of trash rack operations and identify pathways to address potential losses in recharge opportunities.

4.1.2.b Exploratory Simulation with MWDSC Diversions

The joint water right between San Bernardino Valley and Western Water permits for up to 198,000 ac-ft per year contemplates diversions to, and storage in, the MWDSC reservoirs. To be consistent with the permit language, Western Water requested the inclusion of diversions to

MWDSC reservoirs in the modeling analysis, and the MWDSC reservoirs were thus simulated as a separate scenario (S2). MWDSC reservoir diversions were not included in the original network model due to the need for institutional and operational arrangements that are required to implement this diversion in Seven Oaks Dam operations. Western Water and Metropolitan Water District are initiating discussions of the required agreements, and the exploratory simulation (S2) with MWDSC diversions includes a refined priority scheme to better incorporate the reservoirs. Appendix 4.3 shows the change in net annual average total groundwater recharge, MWDSC reservoir diversion, and water not captured for all FIRO alternatives compared to the baseline WCM for the 30-year POR.

For most FIRO alternatives, there is minimal change from baseline operations for groundwater recharge (Appendix 4.3.1) and diversions to MWDSC reservoirs (Appendix 4.3.2). WFR-2266 and MPC-2266 increase diversions to MWDSC reservoirs. However, EFO-2266 and SFO-2266 result in reductions. There is a minimal decrease at the 2,299-foot, 2,375-foot, and 2,418-foot FIRO Spaces for the EFO, WFR, and MPC FIRO strategies. Diversions increase for SFO-2299 and SFO-2375.

The inclusion of diversions to MWDSC reservoirs (S2) results in a reduction of water not captured (Appendix 4.3.3) compared to S1 (Figure 4-3b) in all except in one FIRO alternative (SFO-2266). This is primarily because the MWDSC reservoirs increase downstream demand compared to S1. Therefore, when a FIRO alternative prescribes a flood control release, more water is diverted to downstream interests with the additional demand of MWDSC reservoirs. While diversions to MWDSC reservoirs cannot be accomplished in current operations, institutional and infrastructural arrangements should be considered and evaluated in the FVA to leverage the additional diversion capacity of MWDSC reservoirs.

4.1.3 Environmental Metrics

Results are based on the 30-year POR simulation for each FIRO alternative for the C1 constraint configuration and S1 network scenario unless otherwise noted. Results are presented below for the three environmental focal areas: upstream of Seven Oaks Dam (upstream focal area [US]; 4.1.3.a), Santa Ana River wash (alluvial fan focal area [AF]; 4.1.3.b), and the perennial stream section (perennial stream focal area [PS]; 4.1.3.c). The metrics are described in Table 3-4.

4.1.3.a Performance of Upstream Focal Area Metrics

The average number of days per year that exceed the WSE thresholds for the US-1 metric are shown in Figure 4-5. Results for all FIRO alternatives are shown in Appendix 4.4.1. Over the 30-year POR, performance for US-1 varies between FIRO alternatives due to the top of FIRO Space rather than the FIRO strategy, so results are presented as the change in number of days above each elevation threshold averaged across the FIRO strategies for each FIRO Space. The 2,265-foot threshold is exceeded most frequently, with the frequency of exceedance increasing as FIRO Space increased. A similar pattern emerges for the 2,299-foot and 2,350-foot thresholds; however, the frequency of exceedances is smaller than for 2,265 feet. There are no exceedances of 2,400 feet over the 30-year POR.

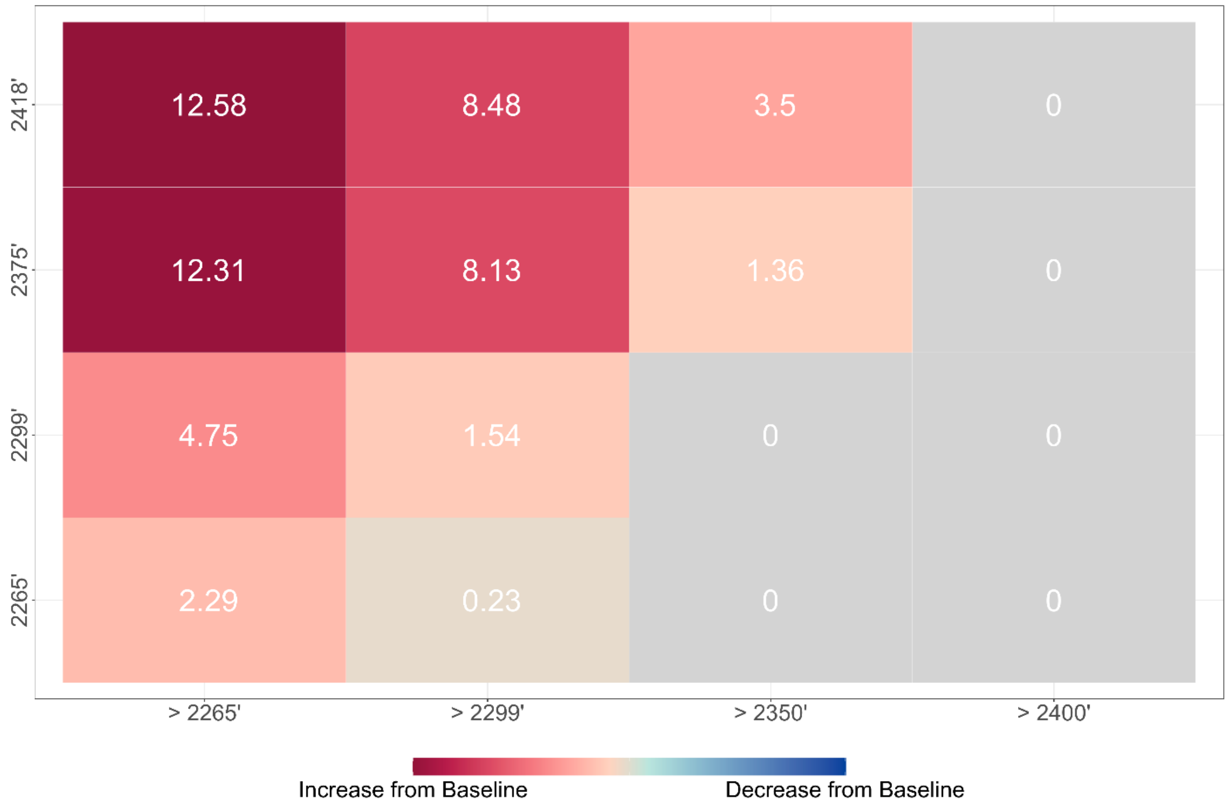

Figure 4-5. *Average number of days per year that Seven Oaks Dam WSE exceeds 2,265; 2,299; 2,350; and 2,400 feet (US-1) over the 30-year POR. Results are presented as the change in days averaged across the four FIRO strategies from baseline WCM operations. Tiles are shaded by performance where darker blue corresponds to fewer exceedances and darker red corresponds to more exceedances compared to baseline operations.*

4.1.3.b Performance of Alluvial Fan Focal Area Metrics

The number of days and times per year that exceed the flow thresholds for the AF-1 metric averaged across the FIRO Spaces is shown in Figure 4-6. The AF-1a and AF-1b metrics do not represent environmental thresholds but rather track opportunities for potential environmental enhancements. There is little variation in performance across the WCP alternatives for AF-1a and AF-1b. The results for all 16 FIRO alternatives are included in Appendices 4.4.2 and 4.4.3. The range of AF-1a (Figure 4-6a) performance across FIRO alternatives would decrease the number of days per year that exceed the flow thresholds by an average of less than two days compared to the baseline WCM. Overall, there are minimal changes from baseline operations for the AF-1b metric (Figure 4-6b). There is a slight increase in lower flows for the two lower FIRO Spaces and a slight decrease in higher flows for higher FIRO Spaces.

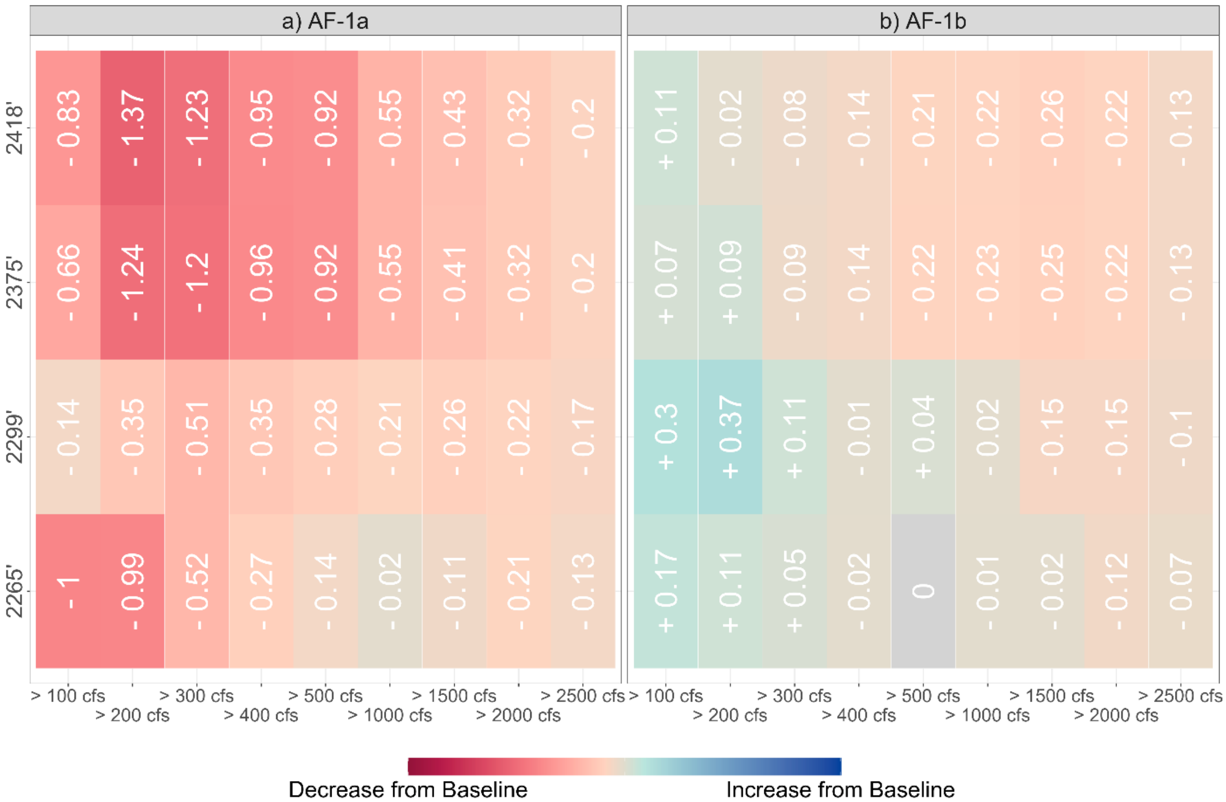

Figure 4-6. *Average number of a) days and b) times per year the flow in the river at Alabama Street exceeds 100; 200; 300; 400; 500; 1,000; 1,500; 2,000; and 2,500 cfs over the 30-year POR. Results are presented as the change from baseline WCM operations averaged across the four FIRO strategies. Tiles are shaded by performance where darker red corresponds to fewer exceedances and darker blue corresponds to more exceedances of the flow thresholds compared to baseline operations.*

4.1.3.c Performance of Perennial Stream Focal Area Metrics

The average number of days and times per year that exceed the flow thresholds for the PS-1 metric across FIRO Spaces is shown in Figure 4-7. The PS-1 metrics do not represent environmental thresholds but rather track occurrences of downstream flow. Like the AF metrics, there is little variation in performance across the WCP alternatives for PS-1a and PS-1b. The results for each FIRO alternative are included in Appendices 4.4.4 and 4.4.5. The range of PS-1a (Figure 4-7a) performance across FIRO alternatives would decrease the number of days per year that exceed the flow thresholds by an average of less than one day compared to the baseline WCM

There are minimal changes from baseline operations for the PS-1b metric (Figure 4-7b). There is a slight decrease in higher flows across all FIRO Spaces. The potential benefits and impacts of downstream Santa Ana River flow quantified by PS-1a and PS-1b will be assessed in the FVA.

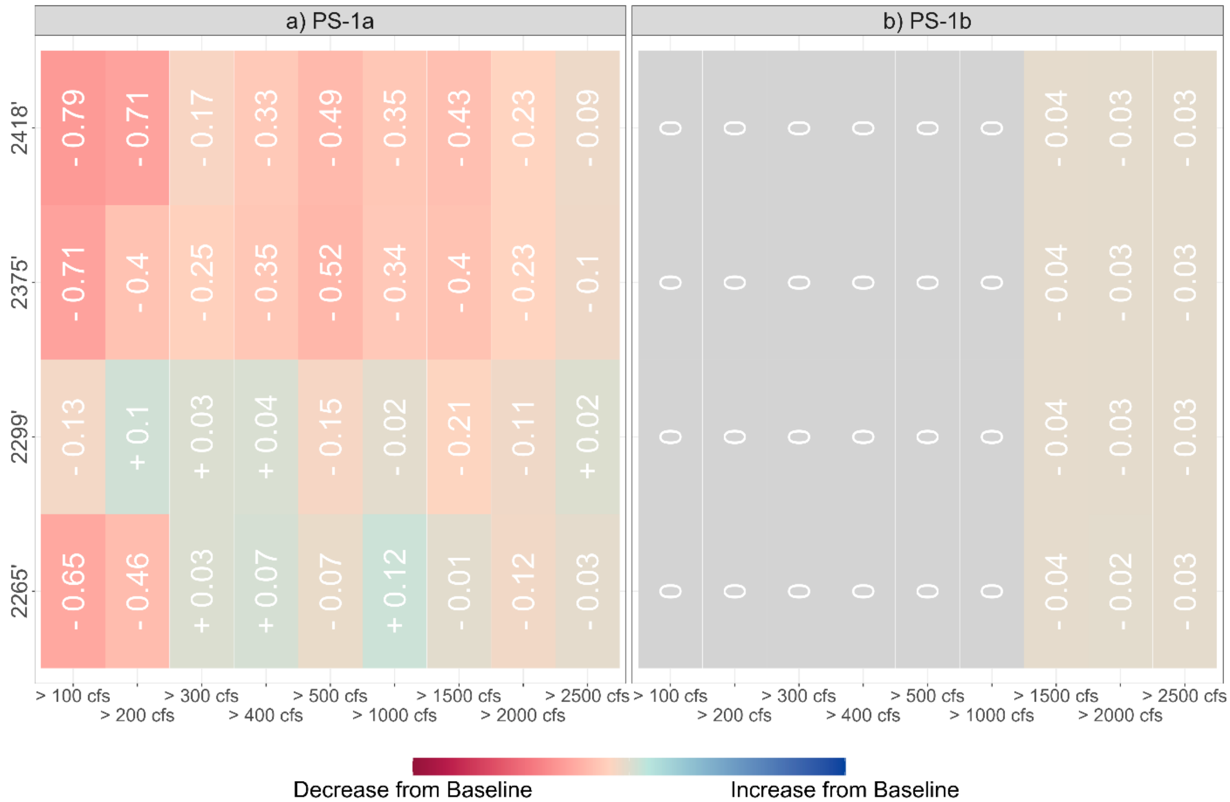

Figure 4-7. *Average number of a) days and b) times per year flow in the river at the perennial stream section exceeds 100; 200; 300; 400; 500; 1,000; 1,500; 2,000; and 2,500 cfs over the 30-year POR. Results are presented as the change from baseline WCM operations averaged across the four FIRO strategies. Tiles are shaded by performance where darker red corresponds to fewer exceedances and darker blue corresponds to more exceedances of the flow thresholds compared to baseline operations.*

4.1.3.d Summary of Impacts Across Environmental Metrics

Overall, the FIRO alternatives slightly reduce the frequency of releases that exceed the flow thresholds for the AF and PS metrics. This is because the FIRO alternatives temporarily store more water in the reservoir, which reduces the amount of water that flows to downstream sections of the system. However, as demonstrated in Section 4.1.2, FIRO alternatives generally increase water availability. While the modeling framework presented here only considers using available water for groundwater recharge and diversions to MWDSC reservoirs, available water could also be used in operations to support environmental outcomes. This would require developing operational rules into the FIRO alternatives that monitor and prescribe releases to support downstream environmental concerns. That was not considered in the scope of the PVA. The FVA will assess potential changes to the metrics to account for potential negative and positive impacts associated with the FIRO alternatives.

4.2 FVA Recommendations

There are several recommended refinements to the FIRO simulation and evaluation process to enhance the FVA study:

- Simulate coupled reservoir and groundwater operations on an hourly time step to better capture peak inflows and releases.
- Simulate a longer continuous record than the 30-year POR using synthetic forecasts for more robust water supply and environmental outcomes.
- Update reservoir storage elevation curves with survey data from November 2025.
- Develop and simulate hydrologic traces that better capture extreme events and their variability within the range of the largest historical event (100-year event) and the RDF (350-year event).
- Extend the downstream extent of the network model to couple operations at Prado Dam rather than using a static input dataset of pool elevations at Prado Dam.
- Explore FIRO Spaces between 2,299 feet (top of trash rack) and 2,375 feet (25 percent of gross pool) to understand the tradeoff elevation for FRM and groundwater recharge outcomes.
- Refine the process to quantify the impacts of current trash rack operations on water supply availability metrics.
- Investigate the optimal forecast horizon to inform reservoir operations in FIRO alternatives. The 14-day forecast horizon was chosen for most FIRO strategies. Assess whether a shorter forecast horizon can better navigate FRM and forecast uncertainty.
- Parameterize the SFO model for the Seven Oaks system and take advantage of recent enhancements by U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center.
- Develop a scenario that minimizes the amount of stored water that needs to be released in excess of the diversion capacity in the July–August period during wet years.
- Include water diversions to senior water rights holders not associated with groundwater recharge.
- Consider development of operational rules to support improved environmental outcomes.
- Develop an approach to account for relevant water quality considerations in reservoir operations.
- Identify next steps for coordination of dam safety considerations with USACE and the California Department of Water Resources Division of Safety of Dams.

4.3 References

USACE LAD (U.S. Army Corps of Engineers Los Angeles District). (2003). *Water Control Manual: Seven Oaks Dam and Reservoir*.

Section 5. Work Team Technical Studies

5.1 Overview and Purpose

Technical studies were conducted as part of the Preliminary Viability Assessment (PVA) to build the scientific foundation needed to test Forecast Informed Reservoir Operations (FIRO) for potential implementation at Seven Oaks Dam. Because FIRO depends on using forecasts to inform release and storage decisions, the studies evaluate whether the watershed can be monitored and forecasted well enough to support safe, effective operations, and what improvements are needed to get there.

Each work team addresses a critical and interconnected component of FIRO, as shown in Figure 5-1 and Table 5-1. The observations work team identifies gaps in monitoring precipitation, snow, soil moisture, streamflow, and discharge, and identifies station installations to improve situational awareness and support model validation. The meteorology and forecast verification work teams conduct studies that characterize storm types that drive extreme precipitation, quantify forecast skill and common error patterns, and identify the processes and conditions that impact forecast reliability at different lead times. The hydrology team completes analyses to improve the inflow record, assess and improve the operational inflow model and hindcasts used in simulation, and provide the data and information needed to support the Water Resources Engineering (WRE) tasks. The WRE team integrates these inputs to simulate baseline and FIRO alternatives and compare performance across the FIRO objectives.

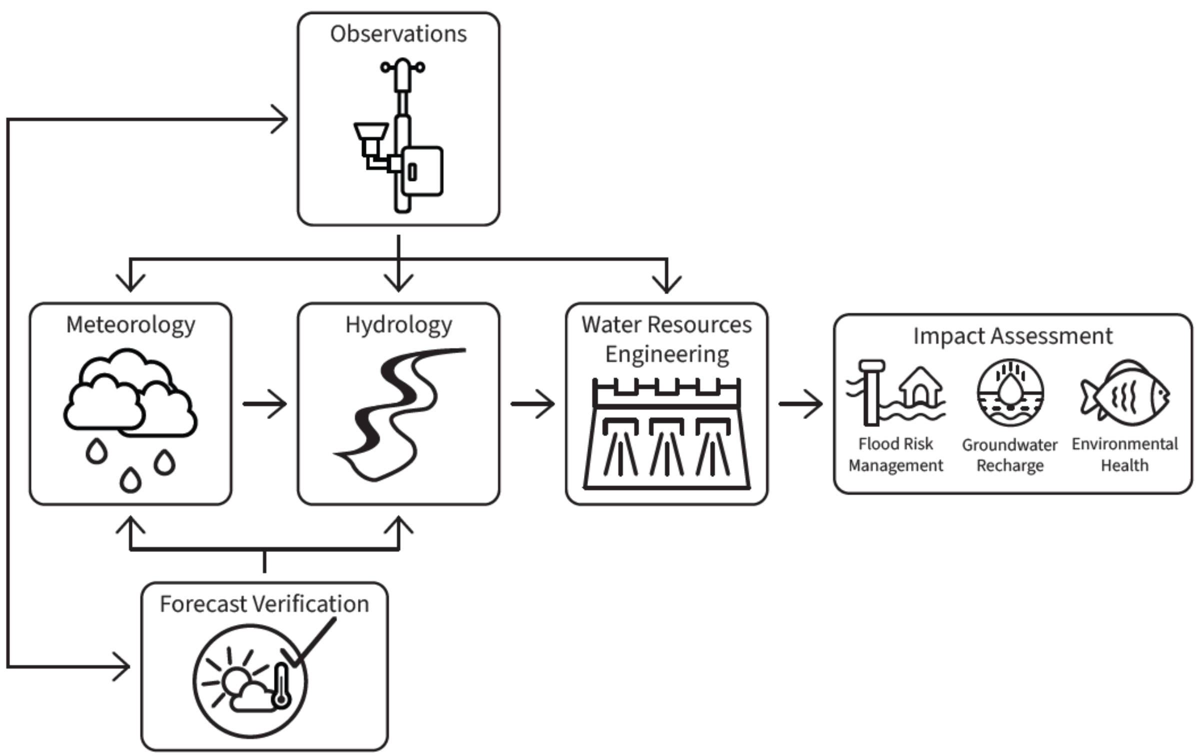

Figure 5-1. *Workflow of FIRO technical work team modeling and interactions in the PVA.*

Table 5-1. *Summary of technical work teams, their roles in the PVA, and why their contributions are essential to evaluating FIRO feasibility at Seven Oaks Dam.*

Work Team	Role in the PVA	Why This Matters for FIRO
Forecast verification and skill	Quantifies forecast skill (e.g., accuracy)	Establishes confidence in forecasts for decision-making at lead times needed to inform operations
Observations	Identifies and addresses gaps in watershed monitoring; improves measurements of precipitation, snow, soil moisture, and streamflow	Provides baseline data needed to evaluate forecast performance, calibrate models, and provide situational awareness
Meteorology	Assesses storm types driving precipitation in the watershed	Determines which weather conditions have the most impact on FIRO operations
Hydrologic modeling	Evaluates and improves inflow data and models	Translates forecasts into inflow estimates used to test different operating parameters
WRE[a]	Simulates different FIRO alternatives using forecasts and inflows within system constraints	Provides the formal feasibility evaluation of FIRO alternatives
Groundwater recharge and dam diversion modeling	Develops models to simulate groundwater recharge operations coupled with reservoir operations	Establishes modeling framework to assess FIRO benefits for groundwater recharge
Environmental Resources	Develops metrics to evaluate ecological habitat impacts and benefits for FIRO alternatives	Ensures operational changes are evaluated against regulatory requirements and identifies potential ecological benefits

[a] Presented in Section 3: How FIRO Viability Was Assessed and Section 4: Assessment Results.

During the workplan phase of the FIRO viability assessment process, select work teams conducted preliminary studies to support the PVA. The preliminary technical studies report is included in Appendix 5.1. The following sections summarize the technical studies completed during the PVA, which form an integrated evidence base to guide potential deviation requests and evaluate FIRO feasibility.

5.2 Forecast Verification and Skill

5.2.1 Role of Forecast Verification Work Team and Questions Addressed

The verification component of the PVA evaluates the skill, reliability, and clarity of meteorological and hydrologic forecast information to support operational decision making at Seven Oaks Dam. The assessment focuses on quantifying the skill of precipitation and inflow forecasts, understanding how errors evolve in time, and identifying the atmospheric–hydrologic linkages that drive performance. This work provides the exploratory evidence base needed to suggest when, and to what extent, forecasts could be used for FIRO-related operations.

Key questions guiding the skill assessment include precipitation and inflow forecast skill within the Seven Oaks basin, as well as post-event and seasonal verification of impactful atmospheric river (AR) storms and freezing level. This section analyzes event- and seasonal-scale precipitation errors, storm-evolution variability, and freezing level uncertainty to assess predictability and its impact on operations and future AR research.

Accomplishments in support of FIRO:

- Evaluated an operational reforecast model for precipitation forecast skill of top 5 percent of events from 2000 to 2019.
- Evaluated inflow forecast skill at Seven Oaks Dam using the California Nevada River Forecast Center (CNRFC) hindcast and a suite of metrics from 1989 to 2019.
- Evaluated the sensitivity of rain–snow partitioning with observational uncertainty from snow level.

Key findings:

- The Santa Ana River watershed benefits from high predictability of extreme precipitation, a low number of false alarms, and strong dry-forecast reliability—all advantageous conditions for FIRO.
- Historical forecast skill of extreme events in the area containing the Seven Oaks basin is ranked amongst the top 10 percent nationally.
- Dry forecasts that mask extreme events (e.g., missing a top 20th-percentile event) are extremely rare.
- Inflows associated with large events (≥ 80th percentile) demonstrate higher skill than smaller events, consistent with positive Brier skill scores.
- Analysis of the 10 largest inflow errors (absolute error) shows that seven of our 10 events were underpredicted, with the largest error being –19.39 thousand acre-feet.
- The largest observational uncertainty in rain–snow partitioning is approximately ±7 percentage points across three water years examined. In practice, this corresponds to uncertainty in the rain fraction ranging from about 53.7 percent to 67.5 percent.

5.2.2 Results

5.2.2.a Precipitation Forecast Skill

The forecast verification team evaluated the skill of quantitative precipitation forecasts (QPFs) for extreme precipitation over the Santa Ana River watershed from a global operational model reforecast (GEFSv12). See Appendix 5.2.1 for more information.

Results show that the Santa Ana basin consistently ranks among the highest-skill watersheds in the nation for predicting extreme 24-hour precipitation, placing in the top 10 percent nationwide at all lead times (one to 10 days). Forecast skill was measured using the critical success index (CSI), where 0 is no skill and 1 is perfect skill. CSI for the top 5 percentile events remains better than random (i.e., CSI > 0.33) out to three to four days, providing multiple days of potentially usable guidance for extreme mean areal precipitation (MAP) related to FIRO decision timelines. Even by the eighth or ninth day, when national skill typically collapses, the Santa Ana River watershed still retains marginal but non-negligible predictability of top 5 percent events.

False alarm behavior and dry-forecast reliability further reinforce this performance. The false alarm ratio in the Santa Ana basin is among the lowest 10 percent nationally, meaning forecasts rarely predict extreme rainfall that does not occur—an important consideration for avoiding risks associated with unnecessary preemptive releases. Similarly, the dry forecast failure ratio is exceptionally low: 0 percent at day 1 and below 1 percent even at days 8 and 9, indicating that forecasted dry periods almost never mask extreme events. This supports reservoir operators' confidence that dry forecasts—particularly beyond the first several days—rarely underestimate risk. The meteorology team also evaluated the predictability of AR and non-AR events (see Section 5.4).

Overall, the findings show that the Santa Ana River watershed benefits from high predictability of extreme precipitation, low number of false alarms, and strong dry-forecast reliability—all advantageous conditions for FIRO. These characteristics suggest that reservoir operators can leverage short- to medium-range QPF to support dynamic storage, risk-based decision thresholds, and operational flexibility during major storms, especially when guided by AR-aware forecasting strategies.

5.2.2.b Inflow Forecast Skill

The inflow forecast skill at Seven Oaks Dam was examined with a focus on lead times and flow conditions most relevant to FIRO. See Appendix 5.2.2 for more information.

Using ensemble inflow forecasts from the National Weather Service Hydrologic Ensemble Forecast System (HEFS), the analysis assessed deterministic and probabilistic forecast performance across lead times ranging from one to 10 days and accumulation periods of 24, 72, and 120 hours. Emphasis was placed on elevated inflow conditions associated with meteorologically significant events, such as ARs, which pose the greatest operational risk.

Results showed that HEFS forecasts provide meaningful skill for moderate to high inflow thresholds (i.e., 80th and 90th percentile events) that are most relevant for FIRO decision making. Probabilistic performance, measured using Brier skill score, is consistently positive for these percentile inflow thresholds across lead times, indicating reliable exceedance guidance for elevated flows. Although deterministic accuracy degrades with increasing lead time, forecast correlations remain sufficiently high to explain a substantial portion of inflow variability at short- to medium-range horizons, particularly when flows are evaluated over multiday accumulation windows. This indicates that forecasts retain useful information about the timing and relative magnitude of inflow events, even as uncertainty increases.

In contrast, forecast skill for low-flow thresholds is poor, with negative Brier skill scores at the 10th percentile, reflecting limited predictability and reduced value for low-flow applications. HEFS provides substantially greater value for flood risk management (FRM) than for low-flow forecasting, consistent with its calibration and design. Evaluation of a hindcast simulation driven by observed meteorological forcings demonstrates that hydrologic model performance is generally robust, and that forecast skill in the operational system is primarily constrained by atmospheric predictability rather than hydrologic model limitations.

Together, these findings support the use of HEFS ensemble inflow forecasts as a decision-support tool for FIRO operations at Seven Oaks Dam, particularly for anticipating elevated inflows and managing flood risk. The identification of the largest inflow events and largest forecast errors further provides a targeted foundation for forecast value assessment, enabling deeper investigation of predictability limits and sources of uncertainty during the events that matter most for FIRO decision making.

5.2.2.c Other AR Characteristics and Their Predictability

Freezing-level forecasts are critical for water management because they influence the rain–snow partitioning and subsequent runoff during extreme precipitation events. See Appendix 5.2.3 for more information. In the Seven Oaks basin, elevations range from 2,600 to 11,500 feet, while freezing levels vary between 2,600 and 13,125 feet, often impacting precipitation phases across the basin. Accurately assessing forecast skill for freezing levels provides essential context for hydrologic predictions. Freezing levels can be approximated by the 0°C isotherm (Z0C) from models or by bright band heights (BBH) from vertical profiling radar. Observational uncertainty in these measurements was accounted for by sampling the mean difference and standard deviation between Z0C and BBH, allowing a probabilistic estimate of rain–snow partitioning.

By incorporating observational uncertainty through random sampling of snow level displacements, the study distinguished between errors arising from model forecasts versus observational variability. Results show that mean displacements between Z0C and BBH vary by location (e.g., 250 meters at Seven Oaks Dam, 350 meters at San Bernardino), and standard deviations often exceed the mean, highlighting substantial real-world variability. Analysis of water years 2022–2024 indicates that 54 to 62 percent of precipitation fell below the snow level, with uncertainties quantified from observational variability. The largest observational uncertainty range of rain–snow partitioning is on the order of 9 percent across three different water years.

CNRFC forecasts demonstrate an approximately 95 percent probability of detection within observational uncertainty. Center for Western Weather and Water Extremes' (CW3E's) 200-member ensemble forecasts further characterize the uncertainty in freezing levels. Preliminary decision-support analyses suggest that ensemble-based approaches provide valuable information for rain–snow partitioning, supporting improved hydrologic forecasting and operational water management in the Seven Oaks basin.

In addition to the work in this section, the meteorology team also explored further mechanism attribution and case studies that are summarized in Section 5.4.

5.2.3 Recommendations for the Final Viability Assessment (FVA)

- Continue to identify mechanisms impacting the predictability of extreme events, high inflow events, and linkages between ARs and non-AR predictability.
- Refine inflow verification for additional clarity on high-flow events.
- Determine relationships between meteorological input uncertainty and hydrologic forecast errors.
- Continue to develop probabilistic assessments of extreme precipitation and rain–snow partitioning across the Seven Oaks basin.

5.3 Observations

5.3.1 Role of Observations Work Team and Questions Addressed

Meteorological and hydrological observations provide empirical data needed to validate forecasts, evaluate model skill, and refine decision-support tools used in reservoir operations that are central to FIRO. Observing precipitation amount and phase, snow depth, soil moisture, freezing level, and discharge allows researchers to compare predicted versus observed conditions, diagnose the causes of precipitation and runoff forecast errors, and evaluate the performance of hydrologic and atmospheric models used for operational decision making. These data also feed in situ decision-support tools that provide real-time situational awareness of storm evolution, watershed response, and runoff generation.

The Seven Oaks FIRO technical studies identified major observational gaps in the Seven Oaks watershed, especially for snow, soil moisture, and discharge, that limit the ability to evaluate forecast skill and model performance. The PVA identified new stations to close gaps and answered core questions from the workplan, such as where additional observations will have the greatest impact, what measurement types are most needed, and what observations gaps remain.

Accomplishments in support of FIRO:

- Scouted prospective station locations to fill meteorological and hydrological observational gaps identified through the technical studies report and discussion with work teams and FIRO partners.
- Secured permits for two hydrometeorological stations and one stream gage and began permitting for one disdrometer station.
- Installed two hydrometeorological stations and began the process to disseminate the data to partner websites.
- Prepared all other station components (stream gage and disdrometer station) for deployment to deliver near real-time data to support forecast verification, model evaluation, and decision-support tools.

Key findings:

- Persistent precipitation forecast biases in the one- to five-day lead time Western Weather Research and Forecasting (West-WRF) reforecast align with sparsely observed areas, underscoring the need for expanded coverage of precipitation observations.
- There are insufficient mid-elevation rain-snow observations; small freezing-level shifts strongly affect rain–snow partitioning and runoff, and targeted monitoring can improve understanding of freezing levels in the basin.
- There are currently no active stream gages in the Seven Oaks watershed. A former U.S. Army Corps of Engineers (USACE) gage monitored inflows during dam construction. The proposed new gage would capture flows from 86 to 92 percent of the reservoir’s contributing area, providing valuable monitoring coverage and improving reservoir inflow estimates.

5.3.2 Results

Existing hydrometeorological stations (Figure 5-2) and historical gage (Appendix 5.3.5) and snow survey data (Appendix 5.3.4) provided context for current observation needs. The technical studies identified major gaps (summarized in Appendix 5.3.1), including sparse upper-elevation coverage, insufficient mid-elevation rain–snow observations, and lack of near real-time soil moisture and streamflow data. Subsequent analyses and partner discussions refined these findings and guided the selection of priority monitoring sites.

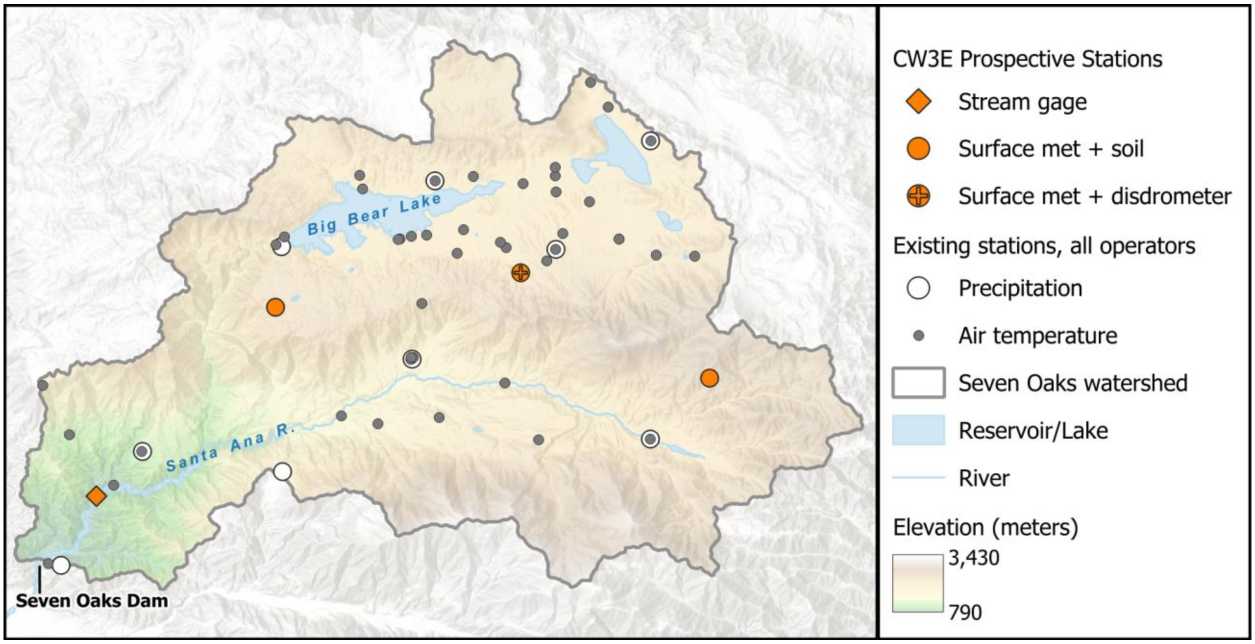

Figure 5-2. *Map of prospective station additions to the Seven Oaks watershed (orange diamond = stream gage location; orange circles = two hydrometeorological stations; and orange circle with plus sign = disdrometer station) and existing stations in the watershed (white circles = station with precipitation measurements; grey circles = station with air temperature measurements).*

Analysis of 24-hour West-WRF reforecast precipitation (2008–2019) revealed systematic west–east bias patterns that aligned with areas lacking station coverage (see Appendix 5.3.2), informing where additional precipitation observations could resolve uncertainty in the spatial distribution of precipitation. Prospective locations for two new hydrometeorological stations aim to close the gap in the western region of the basin where precipitation is over-forecasted and the eastern region of the basin where precipitation is under-forecasted (Figure 5-2; summary of station components and siting effort in Appendix 5.3.6).

No stations in the basin currently provide near real-time soil moisture or snow depth observations. Snowpack and soil moisture are key controls on runoff timing and magnitude, representing water stored in snow and soil, respectively. The planned hydrometeorological stations incorporate soil moisture and snow depth measurements to address these gaps.

Accurate precipitation-phase measurements, such as those provided by a disdrometer, are critical for understanding shifts in the freezing level, which affect runoff timing and flood risk. Continuous, high-resolution precipitation phase observations within the basin's primary elevation band (approximately 6700 to 7700 feet) will strengthen forecast verification, model validation, and situational awareness for decision support (see Appendix 5.3.3).

Streamflow observations are a priority for improving hydrologic model performance. Re-establishing a gage near the former USACE site, or at a nearby upstream location (Figure 5-2), would capture flows from approximately 86 to 92 percent of the basin area, improving inflow characterization and model validation. The planned gage measures water level, or stage, and requires manual discharge measurements to establish a rating curve (see Appendix 5.3.6 for station components and siting effort). Preliminary site assessments indicated that river morphology may hinder manual discharge measurements during high flows, limiting the ability to develop a rating curve representative of the full range of flow. A non-contact gage measuring velocity is recommended to help overcome these challenges by enabling continuous monitoring of velocity to further constrain rating curve development.

5.3.3 Recommendations for the FVA

- Continue to interface with other work teams to ensure existing and new observations are integrated into analyses and workflows.
- Consider additional stream gaging methods such as velocity or slope-based techniques to complement the current stage-based technique and better account for the flashy hydrology and dynamic nature of the Santa Ana River channel.
- Renew snowpack monitoring efforts.
- Maintain ongoing evaluation of observation network performance to identify evolving gaps and optimize station placement.

5.4 Meteorology

5.4.1 Role of Meteorology Work Team and Questions Addressed

Understanding the meteorological phenomena that modulate precipitation and influence forecast skill is essential for successfully implementing FIRO. Flexibility in reservoir operations relies on accurate forecasts of precipitation and the storms that produce said precipitation at sufficiently long lead times. The meteorology team assessed the contribution of ARs and other storm types to total precipitation in the Seven Oaks basin, as well as their role in precipitation extremes. The team also investigated the factors that influence precipitation forecast skill and potential sources of forecast error.

Accomplishments in support of FIRO:

- Created precipitation and AR event catalogs specific to the Seven Oaks basin.
- Analyzed relationships between ARs and precipitation in the basin.
- Investigated non-AR sources of precipitation in the basin.
- Evaluated forecast skill for AR-related and non-AR-related precipitation.
- Conducted case studies of AR-related and non-AR-related events with low forecast skill.

Key findings:

- ARs are the primary source of precipitation in the basin; 70 percent of total precipitation fell on days with an AR over the basin, and ARs were present during 85 percent of extreme events.
- Closed lows (i.e., areas of low pressure aloft with well-defined cyclonic circulations) frequently contribute to precipitation in the basin but rarely produce extreme precipitation in the absence of an AR.
- Forecast skill for the top 5 percent of wet days is higher on AR days versus non-AR days at lead times of one to five days, suggesting that the presence of ARs increases predictability of extreme precipitation.

5.4.2 Results

The Seven Oaks basin receives a substantial portion of its precipitation from a small number of relatively infrequent events. Between water years 2003 and 2024, precipitation occurred during only 18 percent of all days, and 50 percent of the total precipitation fell within < 2 percent of days. Extreme precipitation events, here defined as events exceeding the 95th percentile of daily precipitation (approximately 34 millimeters), accounted for 53 percent of total precipitation. Like other basins in Southern California, precipitation varies seasonally, with 60 percent of total precipitation and 73 percent of extreme events occurring in December–February, and only 7 percent of total precipitation and 1 percent of extreme events occurring in June–August (Appendix 5.4.2, Figure 5-38).

On average, ARs were detected over the Seven Oaks basin on 47 days per year during water years 2003–2024. The highest frequency of ARs was observed during December, and the lowest frequency was observed during July–September (Appendix 5.4.2, Figure 5-39). Of the 788 unique AR events identified over the basin, 79 received an AR Scale ranking of AR 0, 72 received a ranking of AR 1, 26 received a ranking of AR 2, and only 3 received a ranking of AR 3 following a modified version of the Ralph et al. (2019) AR Scale (Appendix 5.4.2, Figure 5-40). Higher AR Scale rankings are indicative of stronger and/or longer-duration ARs and tend to be associated with more extreme hazards and increased severity of impacts (Corringham et al. 2019). Most AR events did not meet the duration and/or integrated vapor transport (IVT) magnitude criteria to be assigned an AR Scale ranking. AR events in the basin tend to be short-lived; 76 percent of unique AR events lasted < 24 hours, and only 4 percent of events lasted ≥ 48 hours (Appendix 5.4.2, Figure 5-39). Compared to coastal locations in Southern California, the more inland location and relatively high elevation of the Seven Oaks basin limits moisture transport in the basin.

Results from the precipitation and AR event catalogs confirm that ARs are the primary source of both total and extreme precipitation in the basin. While ARs were present on only 13 percent of all days, 70 percent of total precipitation fell on AR days, and the number of AR days explains 48 percent of the variance in annual precipitation. ARs were present during 87 percent of the top 10 percent nonzero precipitation days and 85 percent of extreme precipitation events (Figure 5-3). Besides event duration, IVT magnitude and direction differentiated extreme events from non-extreme events. A majority of extreme events featured maximum IVT ≥ 250 kg/m/s and mean IVT directions between 180° (southerly) and 240° (west-southwesterly; Appendix 5.4.2, Figure 5-41). Non-extreme events were much more likely to occur without an AR and generally featured weaker IVT magnitudes and a broader range of IVT directions. A comparison of daily MAP and IVT on AR days revealed that the component of IVT along 202° (south-southwesterly) was most strongly correlated with MAP, but the component of IVT along 184° (southerly) yielded the largest increase in MAP with respect to IVT magnitude.

In addition to ARs, closed lows frequently contribute to precipitation in the basin. These features are often difficult to forecast, especially when they become separated from the background large-scale flow. Closed lows were present during 41 percent of all precipitation days and were the largest source of precipitation during March–May. It is not unusual for ARs and closed lows to impact the basin simultaneously; 35 percent of total precipitation fell on days when both an AR and a closed low were present, 35 percent fell on days when only an AR was present, and 17 percent fell on days when only a closed low was present (Figure 5-3). When closed lows and ARs occur in tandem, the combination of dynamical forcing for ascent ahead of the closed low and upslope moisture flux within the AR can enhance precipitation. More than 50 percent of extreme events featured both a closed low and an AR. Closed lows rarely produce extreme precipitation in the absence of an AR; only 12 percent of extreme events featured a closed low and no AR. The relatively small contributions of ARs and closed lows to June–August precipitation suggests that other sources, such as the North American monsoon and tropical cyclones, are important drivers of summer precipitation.

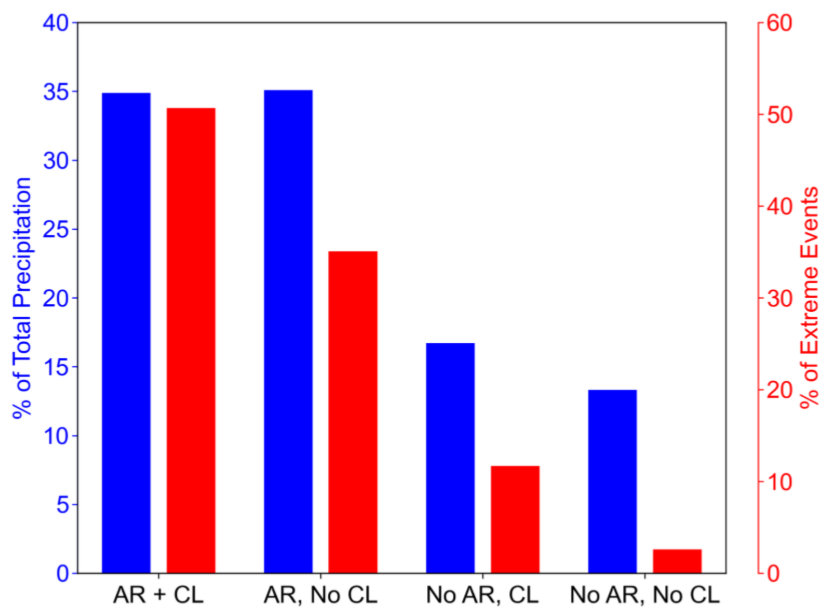

Figure 5-3. *Blue bars: percent of total precipitation falling on days with both an AR and a closed low (AR + CL), days with an AR but no closed low (AR, No CL), days with a closed low but no AR (No AR, CL), and days with neither an AR nor a closed low (No AR, No CL). Red bars: percent of extreme precipitation events featuring both an AR and a closed low, an AR but no closed low, a closed low but no AR, and neither an AR nor a closed low.*

A QPF skill assessment of 24-hour periods exceeding the top 5 percent of nonzero precipitation days in the Santa Ana HUC-8 watershed found much higher forecast skill on AR days than on non-AR days at lead times of one to five days (Appendix 5.4.2, Figure 5-42). The CSI on AR days was > 0.5 at one-day lead time and did not drop below 0.33 until day 5, whereas the CSI on non-AR days consistently remained below 0.25. Lower CSI scores on non-AR days may be influenced by small sample sizes of forecast precipitation above the top 5 percent threshold. At lead times of six to nine days, there were fewer than 10 forecasts above the top 5 percent threshold on non-AR days, and the CSI was not calculated. Even at lower thresholds (e.g., top 10 percent of precipitation days), the CSI scores for AR days exceeded those for non-AR days at all lead times.

Case studies of an extreme AR event in February 2019 and a non-extreme, non-AR event in December 2021 were leveraged to investigate sources contributing to precipitation forecast error. Both events were previously identified in the technical studies as cases with persistently large operational precipitation forecast biases in the Santa Ana River watershed. The February 2019 event featured a strong AR (AR 3 over the basin) that transported tropical moisture into California and produced 150 millimeters of MAP in the Seven Oaks basin. Both the Global Ensemble Forecast System (GEFS) and European Centre for Medium-Range Weather Forecasts (ECMWF) ensembles struggled to forecast the amplification, timing, and phasing of an upstream 500-hPa trough over the Northeast Pacific. Forecasts at lead times ≥5 days exhibited large spread in the depth and position of the trough, which translated into major uncertainty in the strength and landfall timing of the AR (Appendix 5.4.2, Figure 5-43). Models also failed to capture the intensity of a 250-hectopascal (hPa) jet streak over the Pacific Northwest and the resulting secondary cyclogenesis at lead times ≥ three days. These forecast errors led to a persistent underestimation of precipitation amounts in the Santa Ana River watershed. The December 2021 case featured a slow-moving 500-hPa shortwave trough west of California in the absence of a well-defined AR or tropical/subtropical moisture source. Observed precipitation in the basin was modest (13 millimeters of MAP in 48 hours), with the heaviest precipitation (>100 millimeters) occurring west of Cajon Pass. At lead times of one to three days, models struggled to predict the orientation, amplitude, and propagation speed of the trough and an associated weak surface low-pressure system. Poor prediction of these features in the GFS model translated into an eastward displacement of the regions of strongest upward vertical motion and low-level moisture flux, resulting in significant overestimation of precipitation in the Seven Oaks basin and underestimation of precipitation over Ventura and Los Angeles counties (Appendix 5.4.2, Figure 5-44). CW3E's West-WRF ensemble also incorrectly predicted intense precipitation (> 50 percent probability of > 2.5 inches in a 24-hour period) over the basin at just a two-day lead time.

5.4.3 Recommendations for the FVA

- Explore how the background large-scale circulation pattern modulates precipitation and storm characteristics in the basin using a catalog of historical weather regimes.
- Investigate meteorological processes that produce short-duration, high-intensity rainfall over the basin.
- Coordinate with the forecast verification team to leverage precipitation and AR event catalogs to identify meteorological sources of QPF error in the Seven Oaks basin.
- Consider how future changes in storm activity and temperature, precipitation, streamflow, and snowpack conditions may affect management of the Seven Oaks Dam.

5.5 Hydrologic Modeling

5.5.1 Role of Hydrologic Modeling Work Team and Questions Addressed

Recent hydrologic modeling work to support FIRO at Seven Oaks Dam focused on rebuilding a high-quality historical inflow data record, generating new historical streamflow forecasts to support the WRE team, and demonstrating the improved reliability of CNRFC operational capabilities over previous methods. Because past inflow data were sparse, inconsistent, and based on problematic pool elevation measurements, the team reconstructed a much longer and cleaner inflow record by merging corrected post-2000 reservoir data with pre-dam U.S. Geological Survey (USGS) streamflow records extending back to the late 1800s. This expanded record confirms that very large runoff events (much larger than have occurred in recent decades) have occurred in the distant past but are rare, which helps explain why forecasting them remains difficult and why better historical data are essential for model calibration. Using this improved record, the team collaborated with the CNRFC to generate new ensemble hindcasts (1990–2023) with modern HEFS methods, replacing older hindcasts that lacked sufficient predictability. Together, these efforts highlight the need for continued improvements—such as upgraded pool elevation sensors, recalibrated hydrologic models, and better precipitation and precipitation-type inputs—to strengthen FIRO evaluations and future forecast performance.

Accomplishments in support of FIRO:

- Located, consolidated, and curated historical observations that support natural inflow calculations across the period of record (late 1800s to 2023).
- Reviewed historical inflows in the context of existing characterizations of hydrologic events (using critical duration estimates and flow frequency analyses from USACE).
- Generated ensemble streamflow hindcasts (1990 to 2023) using the CNRFC HEFS modeling infrastructure that formed the basis of streamflow forecast evaluation work and the production of synthetic ensembles (for the WRE alternatives analysis).

Key findings:

- Historical inflow data were previously sparse and inconsistent, and this likely affects the performance of the CNRFC hydrologic model for the Seven Oaks Dam. Inflow calculations for the post-dam period (2000 to 2023) were improved and expanded to include the pre-dam period (late 1800s to 1994) using historical USGS streamflow data.
- Although very large runoff events have occurred in the expanded historical record (e.g., daily inflows exceeding 15,000 cubic feet per second [cfs] in 1916 and 1938), these are very infrequent (i.e., 75th percentile of inflows is approximately only 500 cfs). This underscores the importance of improving and expanding the historical inflow record (mentioned above).
- Recent recalibration efforts by the CNRFC have improved ensemble streamflow predictions for the Santa Ana River, but predicting large runoff events in this basin remains a challenge. This is likely a consequence of 1) the previous lack of historical inflow records to support model calibration (mentioned above), 2) the relatively small size and topographic variability of the Seven Oaks Dam catchment (which creates

challenges for weather models), and 3) the infrequency of large events (also mentioned above).

5.5.2 Results

5.5.2.a Developing and Characterizing Historical Inflows

During the calibration of the current operational hydrologic model for Seven Oaks Dam, the CNRFC leveraged inflow data computed for 2009 to 2023. This period only contains two events that exceeded daily inflows of 1,000 cfs (corresponding to approximately a five-year return period). Further, the pool elevation data used to compute this previous inflow data set were found to be spuriously problematic, resulting in low biases at both high and low flows. Through the PVA, a longer, higher quality inflow data set was developed (spanning the 2000 to 2023 period with consistent inputs and computations and extended back to the late 1800s using pre-dam construction streamflow data). This process relied upon several data sources:

- The USGS gage downstream of Seven Oaks Dam (#11051501) that reports the combined outflow plus the Southern California Edison canal diversion. These data were used to estimate natural inflows to Seven Oaks Dam.
- The USACE automated pool elevation gage for Seven Oaks Dam.
- The USACE daily manual pool elevation reading archive, to provide quality control for the automated pool readings.
- Storage-elevation curves for the reservoir.

Manual quality control of the automated pool elevation gage data was performed, and the cleaned data were merged with the manual pool readings prior to storage calculations. A linear weighting scheme was used to estimate storage values between storage-elevation survey dates (1999 and 2012). Daily inflows were then computed across 2000 to 2023 (previously limited to 2009) using change in storage at Seven Oaks Dam and data from USGS gage #11051501. Refer to Appendix 5.5.1 for more information on the data sources, quality control process, and inflow calculations.

Note that Big Bear Lake is situated upstream of Seven Oaks Dam, and this system is partially regulated by the local water district. However, using release data provided by the water district for 1998 to 2024, it was determined that any impacts of the upstream regulation to Seven Oaks Dam inflows are minimal and only apply at low flows (on the order of approximately 5 to 10 percent of total flow) because the lake passes inflows during events. Thus, the Seven Oaks Dam inflow calculations discussed above are assumed to represent natural inflows to the system.

In a 1988 report (USACE 1988), the Santa Ana River at the long-standing USGS gage near Mentone (#15051499) just downstream of the dam today was shown to experience very large runoff events (based on the historical record of this gage, which extends back to the late 1800s). The volume frequency curves summarized in this report illustrate that 24-hour inflows could approach 40,000 cfs. However, as shown in Figure 5-4, 24-hour inflows have only exceeded 1,000 cfs a few times (with a maximum in 2005 of approximately 4,000 cfs). Thus, since the dam was built (using specifications outlined in the 1988 report), no events of real consequence to the reservoir have occurred. To help populate the historical inflow data record with as many events as possible, the computed data (2000 to 2023) were merged with the long-standing USGS gage data prior to construction of Seven Oaks Dam, expanding the period of record back to the late 1800s. Note that years 1994 to 2000 were set missing, however, because dam construction occurred throughout this period and natural streamflows could not be reliably computed.

The decision was made to align the critical duration with the preceding Prado FVA, which used a two-day duration. Since the largest events in the historical record occurred prior to 1980, the decision was made to leverage the existing volume frequency analysis from the 1988 report mentioned above, which included return periods for two-day volumes. Additionally, exploration of the updated inflow data set (i.e., records through 2023) revealed similar statistics (e.g., 100-year event for 24-hour inflows of approximately 20,000 cfs, which aligns with the 1988 report).

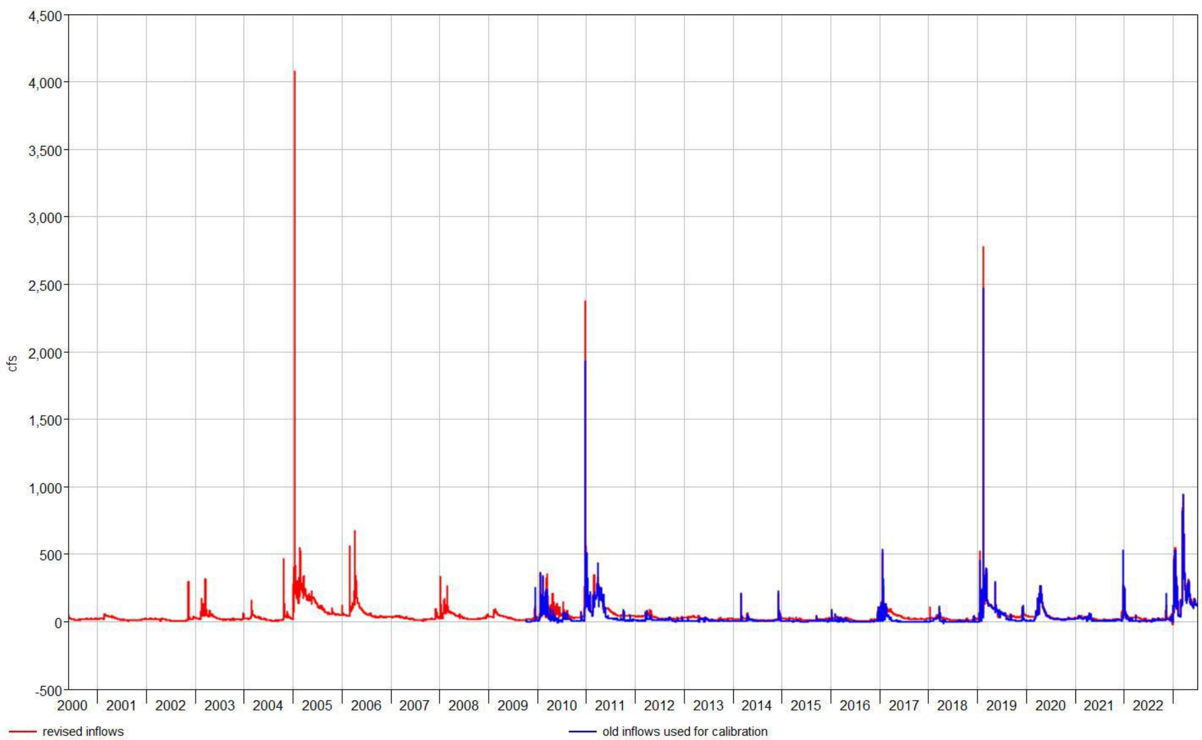

Figure 5-4. *Historical inflow data for Seven Oaks Dam. The recently extended data (red) now span the 2000–2023 period and improve upon the high and low flow calculations using quality-controlled pool elevation data.*

5.5.2.b Generating and Evaluating Ensemble Streamflow Hindcasts

Forecasts of historical runoff conditions, created using today's technology and methods but for periods in the past, are called hindcasts. For FIRO viability assessments, hindcasts of ensemble streamflows are typically generated using RFC HEFS capabilities to 1) assess the predictability of runoff conditions of the recent past using operational hydrologic forecasting methods, and 2) represent uncertainty in the predictions by outputting many different streamflow hydrographs that together account for the variability in the input weather information (e.g., precipitation, temperatures). For this PVA, HEFS hindcasts were produced and evaluated for Seven Oaks Dam inflows across the 1990–2023 period (based on the availability of input weather forecast, or reforecast, information).

Although hindcasts for Seven Oaks Dam inflows were also produced as part of the Prado FVA (across years 1990 to 2019), only observed Seven Oaks Dam outflows and downstream contributions were modeled for this earlier work. As such, the quality of the Seven Oaks Dam inflow hindcasts was not fully assessed during this Prado effort. The original intent was to make use of these previously developed hindcasts for Seven Oaks Dam, but it was ultimately determined that they lacked the predictability required to support the WRE work for this PVA (see Appendix 5.5.2). Thus, in close collaboration with the CNRFC, new HEFS hindcasts were generated for this effort using the latest hydrologic model and HEFS parameters, which are currently used in operations. This is described in more detail in Appendix 5.5.2.

5.5.3 Recommendations for the FVA

- Improve automated pool elevation data quality (e.g., install new station/sensor) to ensure more accurate inflow data.
- Recalibrate the Seven Oaks Dam hydrologic model using an extended and improved inflow data record and regenerate HEFS hindcasts using the recalibrated hydrology models.
- Produce synthetic streamflow ensembles for events within and outside the hindcast period (both scaled and unscaled). These synthetic hindcasts will help provide more rigorous evaluation of candidate FIRO alternatives.
- Explore emerging ensemble prediction capabilities for precipitation and precipitation typing to improve streamflow forecasts for impactful but infrequent events.

5.6 Groundwater Recharge and Dam Diversion Modeling

5.6.1 Role of Recharge and Diversion Work Team and Questions Addressed

An objective of the study at Seven Oaks Dam is to assess how FIRO may improve water supply availability through diversions to groundwater recharge basins and surface water reservoirs. There are several groundwater recharge facilities downstream of Seven Oaks that can divert releases from the dam to be recharged to the San Bernardino basin area. Metropolitan Water District of Southern California (MWDSC) reservoirs may also be available for storage of Santa Ana River water released from the dam. The facilities included in this analysis are described in more detail below.

Accomplishments in support of FIRO include:

- Developed diversion and recharge modeling logic for the four recharge facilities.
- Identified an exploratory modeling framework to assess potential benefits through diversions to MWDSC reservoirs.
- Collaborated with the WRE team to integrate recharge diversion logic with reservoir operations.

Key findings:

- FIRO can increase groundwater recharge across all facilities, with the largest improvements coming in years that are wetter than average.
- A lack of institutional and infrastructural agreements limits current diversion capacity to MWDSC reservoirs.

5.6.2 Results

A modeling framework was developed to simulate how water released from Seven Oaks Dam can be diverted for groundwater recharge and reservoir storage. The framework represents operational and physical constraints of each facility, along with the priorities that determine how flows are allocated.

The framework reflects conditions expected in 2028, the year identified for completion of the FVA. Under these conditions, several groundwater recharge facilities can receive Santa Ana River water released from the dam when they have unused capacity. The framework also incorporates an exploratory scenario in which Santa Ana River water may be diverted to MWDSC reservoirs. Diversions to MWDSC reservoirs are included as a series of explorative simulations due to infrastructural limitations and a lack of necessary institutional agreements that constrain the amount of water that can currently be diverted. The framework identifies two scenarios: (A) diversion to groundwater recharge facilities and (B) diversions to groundwater recharge facilities and MWDSC reservoirs.

5.6.2.a Facilities Included in the Diversion Model

Water released from Seven Oaks Dam can be diverted to the following facilities, shown in Figure 5-5:

- Santa Ana River spreading grounds (SARSG)
- Mill Creek spreading grounds (MCSG)
- San Bernardino County flood control basins (SBCFCB)
- Santa Ana River channel downstream of Seven Oaks Dam (Santa Ana River Channel)
- MWDSC reservoirs[1]

Flows to SARSG, MCSG, and CFCB are diverted from the Santa Ana River downstream of the dam outlet for recharge. Releases not diverted continue to flow in the Santa Ana River and can percolate up to the maximum recharge capacity of the river channel. Any water that is not diverted flows out of the system and is not recharged within the San Bernardino Basin Area. Each facility has a defined diversion capacity and operational constraints.

<u>Santa Ana River Spreading Grounds</u>

SARSG is specifically designed to recharge Santa Ana River water and has the highest recharge capacity of the facilities. The maximum recharge capacity and diversion rate to SARSG is approximately 500 cfs. The model incorporates the variable recharge capacity throughout the water year by simulating reduced recharge rates as the recharge basins become clogged with accumulated sediment over time. More information on the SARSG recharge model is available in Appendix 5.6.1.

<u>Mill Creek Spreading Grounds</u>

These facilities primarily serve to recharge Mill Creek water. They can accept Santa Ana River releases when (1) there is unused capacity and (2) Santa Ana River diversions do not interfere with Mill Creek recharge operations. The maximum recharge capacity of the MCSG is

[1] Diversions to MWDSC reservoirs are included in a separate series of exploratory simulations.

approximately 115 cfs. However, the maximum conveyance rate that can be diverted to the MCSG from Seven Oaks Dam is 60 cfs. An exponential decay function is used to reduce the maximum recharge capacity throughout the water year as percolation occurs to account for clogging. More information on the MCSG recharge model is available in Appendix 5.6.2.

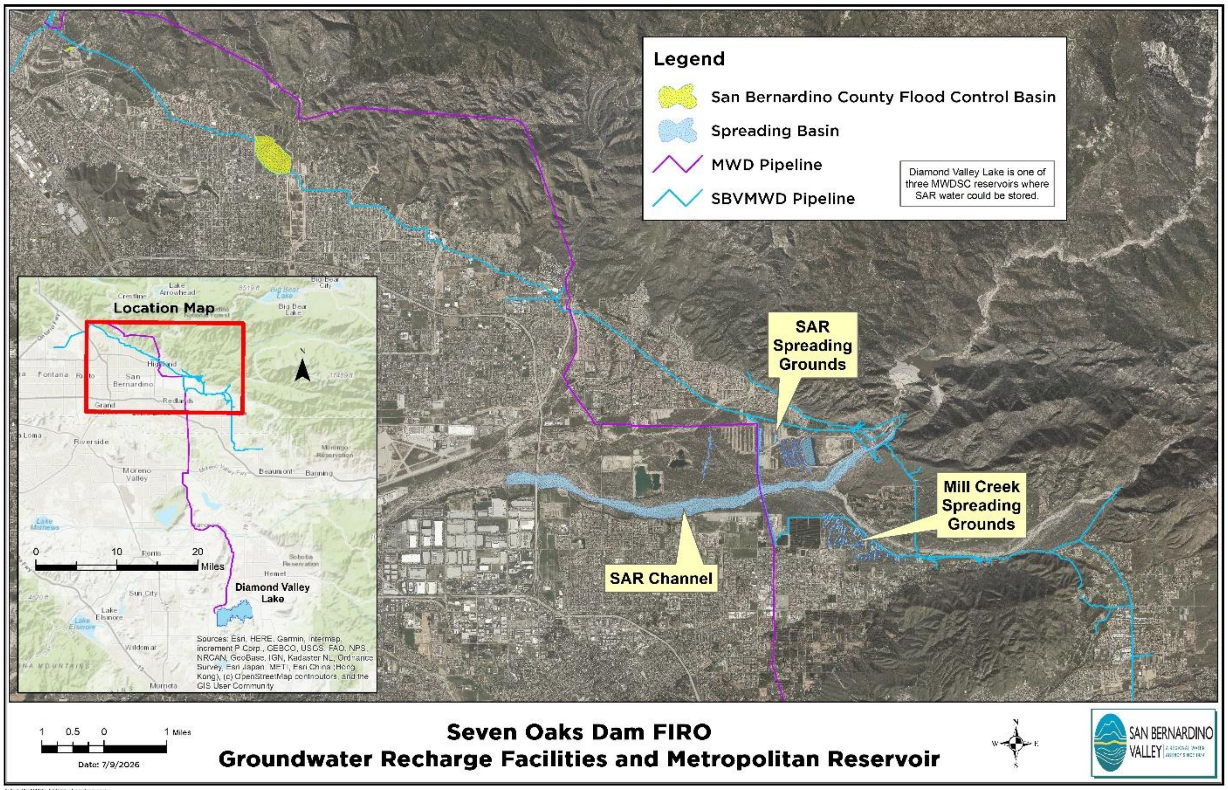

Figure 5-5. *Map of recharge and diversion facilities in the San Bernardino Basin Area. (Credit: San Bernardino Valley Municipal Water District.)*

<u>San Bernardino County Flood Control Basins</u>

The flood control basins owned by the San Bernardino County Flood Control District are used for groundwater recharge only during seasons when the basins are not required for flood risk management (April 1–September 30). The maximum diversion rate to the basins is assumed to be a constant 40 cfs.

<u>Santa Ana River Channel</u>

The channel downstream of the dam provides in-channel recharge. The river channel is assumed to have a constant percolation rate of 30 cfs.

<u>MWDSC Reservoirs</u>

Diversions to MWDSC reservoirs will require completion of institutional agreements with MWDSC. In the modeling framework, the diversion to MWDSC reservoirs is informed by the current water right shared by Westen Water with San Bernardino Valley. The maximum permitted diversion is 1,250 cfs with annual maximum diversions of 100,000 acre-feet. The model assumes demand diversions will not exceed 10 percent of the maximum permitted diversion (10 percent of 1,250 cfs = 125 cfs).

5.6.2.b Priority and Allocation Framework

The framework applies a priority-based allocation system to determine how available Santa Ana River water is distributed among facilities. Two scenarios were analyzed, as shown in Table 5-2 and Table 5-3.

Table 5-2. *Network Scenario 1: Diversions to groundwater recharge.*

Facility	Priority	Percent Allocation
SARSG	1	100%
MCSG	2	50%
Santa Ana River channel	2	50%
SBCFCB	3	100%

Under Scenario 1 (Table 5-2), SARSG receives water first until its operational capacity is reached. MCSG and the Santa Ana River channel equally share second priority and receive any remaining water until their operational capacities are met. Any remaining water is diverted to the CFCB up to the maximum capacity.

Table 5-3. *Network Scenario 2: Diversions to groundwater recharge and MWDSC reservoirs.*

Facility	Priority	Percent Allocation
SARSG	1	100%
MCSG	2	40%
Santa Ana River channel	2	40%
MWDSC reservoirs	2	10%
SBCFCB	3	100%

Scenario 2 expands on Scenario 1 and redistributes second-priority flows among three facilities: MCSG, the Santa Ana River channel, and MWDSC reservoirs. The introduction of MWDSC reservoirs slightly reduces the percentage allocated to the other second-priority facilities.

5.6.3 Recommendations for the FVA

- Update the SARSG model with observational data from recent operations for better representation of recharge rates and impacts of groundwater mounding, especially during back-to-back wet years.
- Improve diversion logic for the MCSG based on available capacity after water from Mill Creek has been diverted.
- Include water diversions to senior water rights holders not associated with groundwater recharge.
- Explore a variable percolation rate model in the Santa Ana River channel.
- Develop a more detailed model of diversion capacity for MWDSC reservoirs.
- Include more detailed representation of basin cleaning and maintenance in the late summer–early fall time frame.
- Develop a scenario that minimizes the amount of stored water that needs to be released in excess of the diversion capacity in the July–August period during wet years.

5.7 Environmental Resources

5.7.1 Role of Environmental Resources Work Team and Questions Addressed

Environmental resources form the foundation of ecosystem health, biodiversity preservation, and sustainable community development. These resources, including water, soil, vegetation, and wildlife, support essential ecological services such as water filtration and erosion control. The maintenance of natural hydrologic processes, native plant communities, and soil stability support both ecological integrity and the long-term resilience of human systems.

Accomplishments in support of FIRO:

- Developed metrics to assess the impacts of FIRO at Seven Oaks Dam on environmental outcomes.

Identified gaps in the current modeling framework to consider water quality operations and Riversidean alluvial fan sage scrub (RAFSS) habitat support.

Key findings:

- Focused metrics on threatened and endangered species habitats, and how FIRO could benefit (or impact) them. The requirements for these species are intended to protect others within the focal area.
- Established metrics for each focal area to account for their differing requirements.
- Incorporated temporal and spatial factors into the metrics.

5.7.2 Results

The environmental team developed metrics to assess environmental benefits across FIRO alternatives. Metrics were identified for the three focal areas being considered by the environmental team. Each focal area is shown in Figure 5-6 and described below:

- Upstream focal area: The area within the maximum water surface elevation possible at Seven Oaks Dam, which is approximately 2,604 feet.
- Alluvial fan focal area: Extends from Seven Oaks Dam downstream along the Santa Ana River, through and including the Santa Ana River Wash, to the La Cadena drop structure.
- Perennial stream focal area: Stretches from the La Cadena drop structure downstream along the Santa Ana River to Prado Dam.

The three focal areas were chosen because multiple threatened and endangered species reside within these areas. Figure 5-7 lists several of these key species, the focal areas they might inhabit, and the times of year when they could be impacted by operations of the dam.

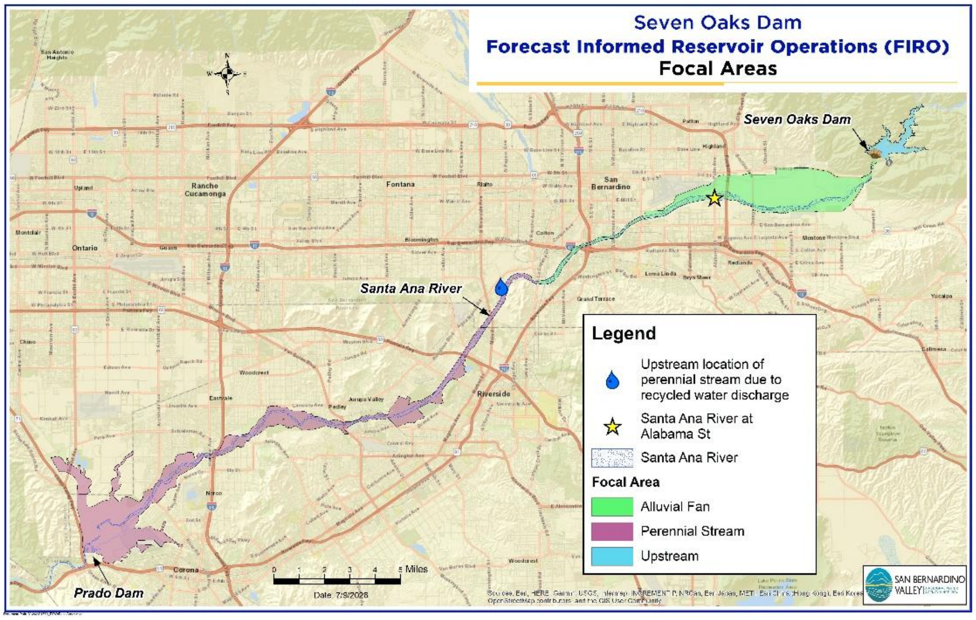

Figure 5-6. *Focal areas considered by the environmental team for FIRO at Seven Oaks Dam. (Credit: San Bernardino Valley Municipal Water District.)*

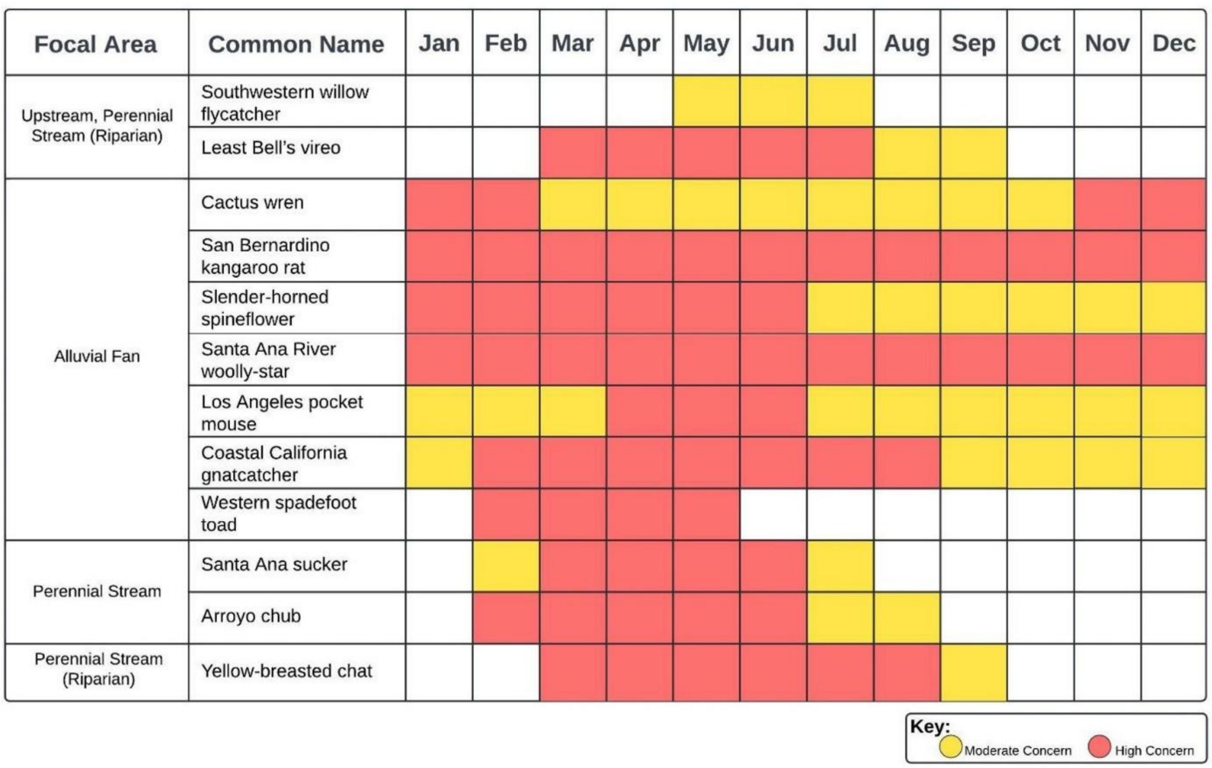

Figure 5-7. *Special-status species occurrence within the focal areas throughout the calendar year and associated level of concern. High concern indicates species' breeding season and potential presence. Moderate concern indicates non-breeding season and potential presence, or within breeding season but concern is lower. (Credit: San Bernardino Valley Municipal Water District.)*

The focal areas are the basis of environmental metrics evaluated in the PVA, shown in Table 5-4. Metrics for the upstream focal area are focused on potential impacts from the temporal and spatial extent of holding water in the reservoir at various elevations (US-1). Metrics associated with the alluvial fan and perennial stream focal areas facilitate comparison of potential impacts from the duration and amount of water released from Seven Oaks Dam that is not diverted for groundwater recharge and travels downstream (AF-1a, AF-1b, PS-1a, and PS-1b). These environmental metrics were established to track model outputs and do not necessarily define environmental impacts or benefits.

Additional metrics were developed that quantify the effects of FIRO on potential water quality changes (US-2, PS-2, PS-3a, and PS-3b) and RAFSS habitat support (AF-2a and AF-2b). Modeling approaches employed during the PVA do not currently support the calculation of these metrics. However, metrics regarding water quality changes and RAFSS habitat support are planned to be evaluated in future phases of FIRO assessment.

Table 5-4. *Environmental metrics developed to assess the impacts of FIRO at Seven Oaks Dam.*

No.	Location	Metric	Modeled in PVA
US-1	Upstream of Seven Oaks Dam	Number of days in a given water year where inundation occurs above water surface elevations of top of intermediate pool (2,265 feet), trash rack pool (2,299 feet), 2,350 feet, and 2,400 feet.	Yes
US-2	Upstream of Seven Oaks Dam	Number of times in a water year that water quality parameters exceed acceptable thresholds during temporary storage in the pool (e.g., harmful algal blooms, turbidity).	No
AF-1a	Santa Ana River Wash	Number of days flow in the river exceeds 100, 200, 300, 400, 500, 1000, 1500, 2000, or 2500 cfs or greater in river channel after all diversions are accounted for.	Yes
AF-1b	Santa Ana River Wash	Number of times flow in the river exceeds 100, 200, 300, 400, 500, 1000, 1500, 2000, or 2500 cfs or greater in river channel after all diversions are accounted for in a given water year.	Yes
AF-2a	Santa Ana River Wash	Number of times during simulation period flow is available for discharge out of enhanced recharge to maintain RAFSS habitat.	No
AF-2b	Santa Ana River Wash	Number of days during simulation period flow is available for discharge out of enhanced recharge to maintain RAFSS habitat.	No
PS-1a	Santa Ana River Wash / Perennial Stream	Number of days flow in the river exceeds 100, 200, 300, 400, 500, 1000, 1500, 2000, or 2500 cfs or greater in river channel at the upstream end of the perennial stream focal area when releases are being made from Seven Oaks Dam per water year.	Yes
PS-1b	Santa Ana River Wash / Perennial Stream	Number of times in a given water year that flow in the river exceeds 100, 200, 300, 400, 500, 1000, 1500, 2000, or 2500 cfs or greater in river channel at the upstream end of the perennial stream focal area when releases are being made from Seven Oaks Dam.	Yes
PS-2	Perennial Stream	Turbidity, pH, temperature and dissolved oxygen levels for water released from the dam that would remain in the river after diversions and recharge potential are accounted for.	No

No.	Location	Metric	Modeled in PVA
PS-3a	Perennial Stream	Number of days a release reaches the perennial stream that is driven by maintenance needs, need to evacuate pool to accommodate a pending storm, or when water quality is unsuitable for recharge purposes.	No
PS-3b	Perennial Stream	Number of times a release reaches the perennial stream that is driven by maintenance needs, need to evacuate pool to accommodate a pending storm, or when water quality is unsuitable for recharge purposes.	No

5.7.3 Recommendations for the FVA

- Translate the "monitoring" environmental metrics into performance metrics to elucidate the environmental impacts or benefits of alternative reservoir operations.
- Assess how to best use environmental metrics.
- Assess how to use flows in excess of the diversion capacity to improve environmental outcomes on the alluvial fan.
- Develop an approach to account for relevant water quality considerations.

5.8 References

Corringham, T. W., Ralph, F. M., Gershunov, A., Cayan, D. R., & Talbot, C. A. (2019). Atmospheric rivers drive flood damages in the western United States. Science Advances, 5(12), eaax4631. https://www.science.org/doi/10.1126/sciadv.aax4631

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Section 6. FIRO Implementation and Final Viability Assessment (FVA) Roadmap

6.1 Recommendations To Be Considered in the FVA

The execution of this Preliminary Viability Assessment (PVA) involved an array of analyses and Forecast Informed Reservoir Operations (FIRO) alternatives to address the feasibility of FIRO at Seven Oaks Dam. As the project transitions from the PVA to the FVA, efforts will focus on selecting and evaluating the most promising FIRO alternatives identified in the PVA. Overarching recommendations listed in the Executive Summary will be implemented during the FVA. Recommendations in Section 4 and Section 5 provide additional guidance that will be considered and prioritized as the FVA is scoped. Work teams will continue to carry out the necessary tasks to complete the FVA, updating the Steering Committee regularly and seeking guidance as needed.

6.2 Possibility for Planned Deviation and Interim Operations

Seven Oaks Dam is currently operated for flood risk management. San Bernardino Valley and Western Water are working with local sponsors (Orange County Flood Control District, San Bernardino County Flood Control District, and Riverside Flood Control and Water Conservation District) to develop an approach for water conservation to be implemented as a secondary purpose of Seven Oaks Dam. As a secondary purpose, water conservation would be subordinate to the primary purpose of flood risk management, like the framework for water conservation at Prado Dam.

Testing FIRO alternatives is done through interim operations: reservoir operations that are allowed to be tested at the dam through a deviation to the Water Control Manual (WCM), prior to completion of a WCM update. U.S. Army Corps of Engineers (USACE) approval is required for a planned deviation from the current WCM if changes to the current Water Control Plan (WCP) are proposed. FIRO spaces within the range of 2,220 feet to 2,265 feet (top of debris and intermediate pools, respectively) will be explored for interim operations, given the results of the preliminary assessment, which demonstrated that water supply availability improvements are possible without compromising flood risk management (FRM).

As part of the process of analyzing a proposed deviation, the local sponsors will coordinate with USACE to determine the scope of work to assess the proposed deviation. This scoping effort will identify relevant factors to evaluate during interim operations. Such topics include dam safety, environmental considerations, operations and maintenance, and other topics identified by USACE and the local sponsors.

The deviation period would ideally be in place, or modified, from the time of approval until FIRO WCP operations are formally approved by USACE for implementation in an updated WCM. It should be noted that in a potential WCM update process, USACE and the local sponsors are informed by the FIRO viability assessment but are not bound to the FIRO operations assessed in the FVA or the interim operations.

Planned deviations, approved at or below the USACE division level, can be minor or major, depending upon the magnitude of the requested deviation from the existing WCP. The USACE guidelines for planned deviations are described in USACE EM-1110-2-240, with additional guidance provided by USACE's South Pacific Division. Requests for a planned deviation can come from the owner of the dam or from the Steering Committee.

6.3 Decision Support Tools

Decision support is a key component of implementing any forecast-informed WCP. Decision support tools are necessary to provide (1) situational awareness of current and expected weather and watershed conditions, and (2) the ability to process forecast inflows and streamflows through reservoir storage and release models. A decision support tools work team will be established during the FVA to assess any gaps in current decision support tools and recommend additional tools to support FIRO operations during interim operations and eventually under an updated WCM. Additionally, reservoir operations for FIRO alternatives may be simulated in real time during the FVA process. These virtual operations demonstrate what may have been achieved if a deviation were in place.

6.4 Timeline

The timeline below (Figure 6-1) shows the sequence of activities that will be conducted between completion of the PVA (August 2026) through completion of the FVA (2028) and additional activities in parallel with and following the FVA. Goals of the additional activities include pursuing a deviation to the WCM to test FIRO in interim operations and, ultimately, developing an updated WCM. The updated WCM would be prepared based on information and experience developed during the deviation period.

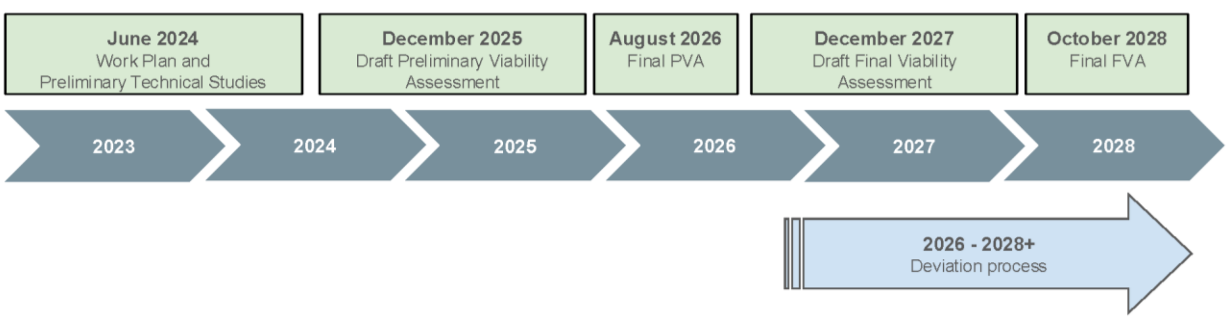

Figure 6-1. *Timeline for the FIRO viability assessment process at Seven Oaks Dam.*

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San Bernardino Valley Municipal Water District
Attn: Greg Woodside
380 East Vanderbilt Way
San Bernadino, CA 92408

August 11, 2026

Dear Greg Woodside:

After reviewing the Revised proposal, it is my pleasure to forward UCSD reference number 82429-2027-30520248 R1 on behalf of The Regents of the University of California.

Title:	Forecast Informed Reservoir Operations (FIRO) at Seven Oaks Dam: Development of the Final Viability Assessment
Principal Investigator:	Kyla Semmendinger-Raney, CASPO (PI Exception Pending)
Co-PI:	Fred M. (Marty) Ralph, CW3E Director - CASPO
Contract/Grant:	New
For:	Research
Period:	October 01, 2026 through September 30, 2028
Amount:	$1,198,416.00

Additional project information may be obtained from PIs Semmendinger-Raney and Ralph. Please note this transmission is only for the submission of the above referenced proposal and it only becomes binding when both parties can agree to the terms and conditions of a written executed Agreement. According to the researcher, the work has been scoped and intentionally proposed as fundamental research. Our researcher intended and has anticipated the scope of the work to be primarily fundamental research and its results to be published and shared broadly in the scientific community. UCSD submits this proposal with the understanding as fundamental research as defined by National Security Decision Directive (NSDD) 189 and the Export Control regulations. As such there should be no limitation on the freedom to publish research results or data, nor restrictions on the citizenship or national origin of those performing the research. If the question on whether or not the work is fundamental research, then the determination will be made by the Government's Contracting Officer prior to execution by the University of any resulting award.

Inquiries concerning contractual or budgetary aspects should be directed to Judy Cheng at judycheng@ucsd.edu. If an award is made, please issue it in the name of **The Regents of the University of California** and forward it directly to this office. Thank you for your consideration.

Sincerely,

Judy Cheng
Principal Contract Officer
Scripps Institution of Oceanography
UCSanDiego

Forecast Informed Reservoir Operations (FIRO) at Seven Oaks Dam: Development of the Final Viability Assessment

Center for Western Weather and Water Extremes (CW3E)
Scripps Institution of Oceanography – UC San Diego

PI: Kyla Semmendinger-Raney, PhD. Co-PI: F. Martin Ralph, PhD.

Period of performance: 1 October 2026 - 30 September 2028

Overview and Purpose

This proposal requests funding from San Bernardino Valley Municipal Water District (San Bernardino Valley) for technical, scientific, and project management support to carry out the final viability assessment (FVA) phase of forecast-informed reservoir operations (FIRO) at Seven Oaks Dam.

There are four major objectives for the funding requested over the next two years:

1. Ensure CW3E staff support for management, coordination, communication, outreach, and facilitation during the FVA process
2. Draft and produce the FVA report for FIRO at Seven Oaks Dam
3. Provide additional capacity for water resources engineering and decision support for progression of the FIRO process
4. Targeted technical studies focused on enhanced monitoring, meteorological analysis, and hydrological forecasting to support FIRO at Seven Oaks Dam

This proposal also supports coordination of CW3E's hydrometeorological research to ensure applicability to the Santa Ana River watershed. For example, ongoing work at CW3E in advancing water prediction is being leveraged to further develop operational forecasts of streamflow prediction in the upper Santa Ana River watershed.

Background

Seven Oaks Dam is operated and maintained by the Local Sponsors: Orange County Flood Control District, San Bernardino County Flood Control District, and Riverside County Flood Control and Water Conservation District. Reservoir regulation for Seven Oaks Dam is conducted by the Orange County Flood Control District staff following the approved Water Control Plan (WCP), contained in a Water Control Manual (WCM; USACE 2003) provided by the U.S. Army Corps of Engineers Los Angeles District. While Seven Oaks Dam is currently authorized only for flood risk management, San Bernardino Valley and Western Water are interested in adding water conservation as a secondary authorized purpose of the dam. San Bernardino Valley and Western Water hold rights to divert up to 198,000 ac-ft per year from the Santa Ana River and store up to 50,000 ac-ft annually at Seven Oaks Dam. The FIRO viability assessment process aims to improve water supply availability for groundwater recharge and water retail purposes for San Bernardino Valley and Western Water.

The phases and schedule of FIRO at Seven Oaks Dam are shown in Table 1. FIRO at Seven Oaks Dam was initiated in 2022 with the workplan phase. This work established a strong foundation for the FIRO viability assessment. The workplan phase resulted in the:

- Formation of a steering committee
- Finalization of the Terms of Reference for the steering committee with specific FIRO goals for Seven Oaks Dam
- Creation of eight technical work teams (observations, forecast verification, meteorological analysis, hydrologic modeling, water resource engineering, groundwater recharge, environmental resources, and communications)
- Development of the workplan (Ralph et al., 2024) to scope tasks to be completed during the preliminary viability assessment (PVA)
- Execution of preliminary technical studies to support the PVA

Upon completion of the workplan in June of 2024, work began to support the PVA. The PVA (Ralph et al., 2026) was published in July 2026 (originally scheduled for late-September 2026). The PVA resulted in the:

- Finding that FIRO at Seven Oaks Dam is viable and recommendation to pursue a FVA
- Siting and installation of two hydrometeorological stations, one disdrometer station, and one streamflow gage within the Seven Oaks watershed
- Development of the PVA report with 24 key findings and 38 recommendations for the FVA across eight work teams
- Continued collaboration and coordination across the technical work teams
- Completion of additional technical studies to support FIRO Seven Oaks

In addition, two technical workshops and two field trips have been conducted to establish common understanding of the system operations and objectives between partners and CW3E staff.

Table 1. Phases of FIRO study and schedule at Seven Oaks Dam

Phase	**Activity**	**Schedule**
Workplan	Develop FIRO viability assessment workplan	June 2024
Preliminary technical studies	Complete preliminary technical studies and prepare report	September 2024
PVA	Prepare FIRO PVA report	July 2026
FVA	Prepare FIRO FVA report	2028
Post-FVA	FIRO incorporated into deviation and/or Water Control Manual (WCM) update	TBD

Context

The 2,800 square mile Santa Ana River watershed (Figure 1) flows from the San Gabriel, San Bernardino, and San Jacinto mountain ranges to its terminus at the Pacific Ocean. These mountains form a barrier to atmospheric river (AR) storms that originate in the Pacific and make landfall in Southern California, forcing moist flow upward and generating clouds and precipitation. Rainfall accumulation during several AR storms per winter season accounts for 40-50% of annual precipitation, with large interannual variability in total precipitation arising due to differences in

AR activity. Thus, these infrequent events contribute significantly to flood hazards and water supply within the Santa Ana River watershed. In tandem with Prado Dam, Seven Oaks Dam prevents flood-related damages from extreme precipitation events in Orange, Riverside, and San Bernardino counties. These events have typically been driven by strong and long-lasting ARs that arrived after earlier events had already moistened the watershed's soils and filled its streams. Operations at Prado Dam and Seven Oaks Dam have historically accounted for such storms, but recent advances in understanding how ARs work and how to better predict them yield the potential to enhance water supply reliability and flood risk management. This project builds on a decade of science to understand AR dynamics and impacts along the U.S. West Coast and on experience in developing the concept of FIRO at Lake Mendocino, Prado Dam, and New Bullards Bar and Oroville dams in California. Research to quantify and improve forecasts of ARs and other precipitation mechanisms is an essential component of FIRO. Research and operational aspects of FIRO include the understanding of and ability to forecast extreme precipitation events and their impact on runoff within the Seven Oaks Dam watershed and to diagnose opportunities for minimizing forecast errors.

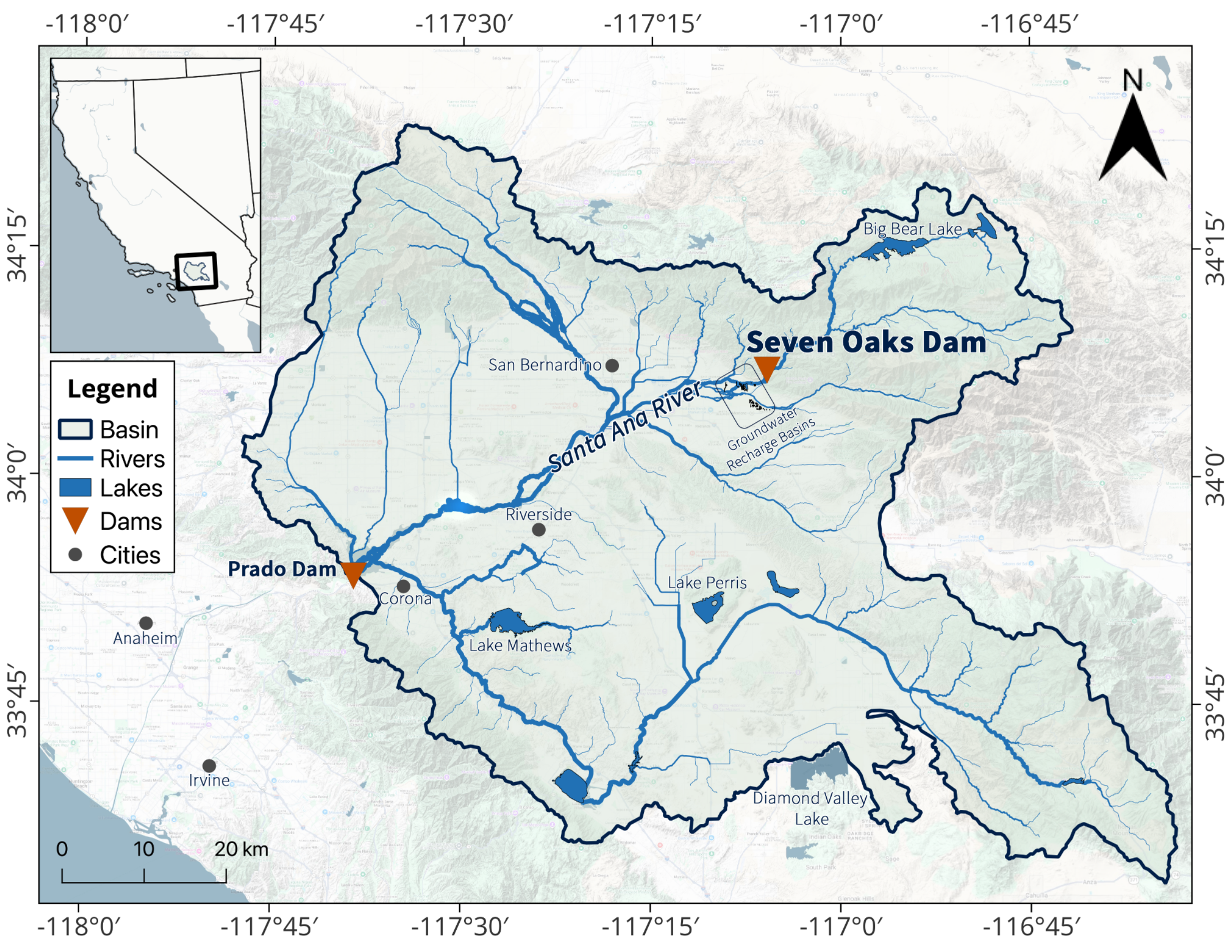

Figure 1. Seven Oaks Dam and the Santa Ana River watershed. The groundwater recharge basins highlighted downstream of Seven Oaks Dam are the primary facilities considered in the FIRO analysis. However, there are additional recharge facilities throughout the watershed that are not considered in the analysis.

Technical Approach

The PVA (Ralph et al., 2026) establishes the background and wider context for FIRO, identifies technical and research gaps, and serves as the foundation for the scope of work to be completed in the FVA. The FVA will consist of additional technical studies to support FIRO and the refinement of the modeling framework to determine FIRO viability and recommend a FIRO alternative at Seven Oaks Dam. The FVA will outline meteorological, hydrologic, engineering, and environmental parameters for FIRO implementation for consideration by USACE for the inclusion of FIRO into the water control manual (WCM).

The FVA phase involves co-leadership of the Seven Oaks FIRO steering committee, planning and executing FIRO meetings and workshops, developing the FIRO FVA report, and conducting additional technical studies to support the FVA at Seven Oaks Dam. The work proposed during the FVA is described in detail below.

<u>Task 1: Ensure CW3E staff support for management, coordination, communication, outreach, and facilitation during the FVA process</u>

This task supports the efforts of Marty Ralph, who co-chairs the Steering Committee, with Heather Dyer (San Bernardino Valley) and Cary Talbot (USACE-ERDC), and CW3E support staff. CW3E support staff include Kyla Van Maanen (project coordinator), Kyla Semmendinger-Raney (project manager), and a FIRO operations manager. Key areas of responsibility include:

- Planning and execution of quarterly meetings of the Steering Committee, including logistics, agenda development, note taking, and meeting facilitation
- Planning and execution of a technical workshop to transition from the PVA phase to the FVA phase of FIRO at Seven Oaks Dam
- Conduction of regular meetings with the technical work teams to facilitate coordination across teams and ensure deliverables are on schedule
- Support from a technical and strategic communications team, including report writing and maintenance of the Seven Oaks Dam FIRO project website
- Travel for CW3E administrative staff for relevant and governmental relations activities, including participation in the Association of California Water Agencies meetings, presentations at national meetings and briefings in Washington, DC and Sacramento, CA, as appropriate.

This task will also support coordination with San Bernardino Valley, USACE Los Angeles District, USACE Engineer Research and Development Center (ERDC), National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS), and other partners so that FVA analyses are developed in a transparent, collaborative, and decision-relevant manner.

<u>Task 2: Draft and produce the FVA report for FIRO at Seven Oaks Dam</u>

Building upon the PVA, CW3E will help guide and coordinate the Steering Committee to develop and complete the FVA. Key areas of responsibility include:

- Developing the FVA report outline and production schedule
- Tracking progress on the FVA to ensure timelines are met and coordinating authors across various sections

- Authoring/co-authoring and reviewing the FVA sections
- Formatting final documents to ensure compliance with state and federal regulations
- Supporting the communications work team tasked with developing final documents and fact sheets for the FIRO effort
- Communicating the FIRO assessment process and results at suitable venues and attending relevant meetings, including technical sessions with relevant water management groups
- Developing an evidence-based recommendation on whether and how to implement FIRO at Seven Oaks Dam

Task 3: Provide additional capacity for water resources engineering and decision support for progression of the FIRO process

Based on recommendations from the PVA, CW3E will implement several modeling improvements to the viability assessment framework to evaluate FIRO and quantify impacts, including:

- Enhancing groundwater recharge models with operational data from recent years
- Developing logic to represent Prado Dam operations within the simulation model
- Refining a subset of FIRO alternatives that showed the most promising results from the PVA
- Supporting the formulation of environmental objectives to inform operations at Seven Oaks Dam
- Identifying any necessary decision support tools needed by the local sponsors and other local water managers to support the implementation of FIRO at Seven Oaks Dam
- Supporting San Bernardino Valley and the Steering Committee in developing a FIRO deviation request for Seven Oaks Dam, including technical justification documentation, as needed

Final approval of deviations and WCM changes remains with USACE. However, the purpose of this task ensures FVA products are structured so they can be used efficiently in those processes. These materials will be Seven Oaks Dam-specific technical inputs derived from FVA results and are not intended to replace generalized USACE district WCM consultation or approval responsibilities.

Task 4: Targeted technical studies focused on enhanced monitoring, meteorological analysis, and hydrological forecasting to support FIRO at Seven Oaks Dam

The technical work teams identified gaps in the current observations network and forecast modeling framework during the PVA. Work teams made recommendations for work to be completed during the FVA to support FIRO at Seven Oaks Dam. Those recommendations serve as the foundation and justification for the additional technical studies, described below.

Task 4.1: Enhanced monitoring
Observations are a critical component to forecast verification, model evaluation, and in-situ decision support tools to enhance management for FIRO objectives. Reliable and accurate observations available in near real-time are required to support these efforts. Results from the preliminary technical studies completed during the workplan phase identified gaps in the existing observations network, including snow, soil, and streamflow measurements. Two

hydrometeorological stations, one disdrometer station, and one streamflow gage were sited and installed during the PVA, shown in Figure 2.

Historically, the watershed included six snow survey locations with periods of record from 3 to 31 years, all ending operation by the mid-1990s. There are currently no publicly available snow surveys or near real-time stations measuring snow depth or snow water equivalent in the Seven Oaks Dam watershed. The lack of real-time snow information is a gap in the current observation network that the FVA will address.

The enhanced monitoring task will continue to identify and fill gaps identified in the observation network to better represent watershed characteristics and hydrometeorological conditions with reliable near real-time monitoring stations. Tasks include:

- Addition of two to three snow pillow sensors to the hydrometeorological and disdrometer stations installed during the PVA.
- Siting and installation of an additional one to two streamflow gages. This may include researching options for non-contact gages that may be better suited for streamflow measurement in the basin due to the flashy characteristics of the watershed.
- Engage with partners to integrate real-time information from the hydrometeorological and disdrometer stations installed during the PVA into ongoing operational and verification efforts.
- Report on gaps filled and summarize remaining gaps in the observations network.

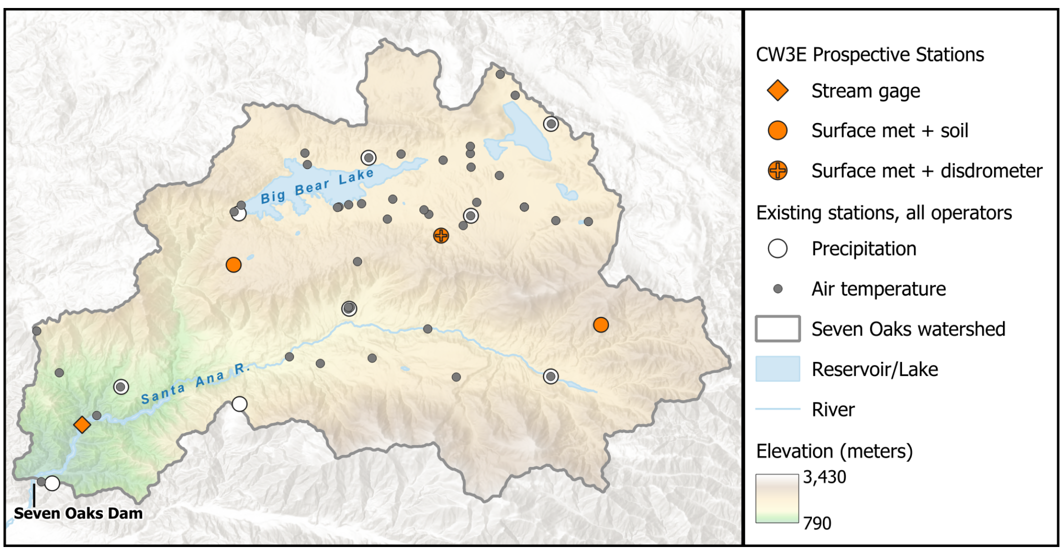

Figure 2. Map of station additions to the Seven Oaks watershed during the PVA (orange diamond = stream gage location, orange circles = two hydrometeorological stations, and orange circle with plus sign = disdrometer station) and existing stations in the watershed (white circles = station with precipitation measurements; grey circles = station with air temperature measurements).

Task 4.2: Meteorological analysis and forecast verification

The meteorological modeling and forecast verification task will address gaps identified in the PVA with respect to weather and AR forecasts. Tasks include:

- Exploring how the background large-scale circulation pattern modulates precipitation and storms characteristics in the basin

- Investigating meteorological processes that produce short-duration, high-intensity rainfall over the basin. Improved recognition of these processes and understanding of their predictability could provide additional situational awareness for water managers when making decisions in real-time operations.
- Identify meteorological sources of QPF error in the Seven Oaks watershed
- Quantifying the uncertainty in AR directionality and distance from the Seven Oaks watershed, which provides important context for water managers decision-making

Task 4.3: Hydrologic modeling and forecast verification

The hydrologic modeling and forecast verification task will address gaps identified in the PVA with respect to forecasts of reservoir inflows. Tasks include:

- Recalibrating the Seven Oaks watershed hydrological model, in coordination with the California-Nevada River Forecast Center, using extended and improved inflow data
- Generating the hindcasts with the recalibrated hydrologic models
- Producing synthetic hydrographs to better capture extreme events within and outside of the hindcast period to more rigorously evaluate flood risk management outcomes for FIRO alternatives
- Refining the inflow forecast verification for high inflow events. Determine relationships between metrological input uncertainty and hydrologic forecast error.

References

Ralph, F. M., Talbot, C., Dyer, H., Anderson, M., Christensen, R., Crisostomo, V., Fam, M., Forbis, J., Haney, L., Laber, J., Miller, B., O'Conor, M., & Tyler, J. 2026. *Seven Oaks Dam Forecast Informed Reservoir Operations Preliminary Viability Assessment*. UC San Diego. https://escholarship.org/uc/item/17p322c7

Ralph, F. M., Talbot, C., Dyer, H., Fairbank, T., Laber, J., Anderson, M., White, R., Haney, L., Forbis, J., Tyler, J., Fam, M., Miller, B., & O'Conor, M. 2024. *Work Plan for Seven Oaks Dam Forecast Informed Reservoir Operations*. UC San Diego. https://escholarship.org/uc/item/8d8893z6

UCSD # 82429-2026

Forecast Informed Reservoir Operations (FIRO) at Seven Oaks Dam: Development of the Final Viability Assessment

Year 1: 10/1/26 - 9/30/27

A. SALARIES	FY Rates Beginning	Monthly Direct Salary Rate	No. Months	% Salary or Effort	Person Mos.	Salary Subtotal	Fringe Benefits %	Fringe Benefits Amount	TOTAL
Kyla Semmendinger-Raney (PI)	7/26	10,062	9.00	20.00%		18,112	50.30%	9,110	27,222
Res/Dev Engr	7/27	10,565	3.00	20.00%	2.40	6,339	51.31%	3,253	9,592
Marty Ralph (Co-PI)	7/26	34,667	9.00	2.00%		6,240	36.30%	2,265	8,505
Director/CW3E	7/27	36,400	3.00	2.00%	0.24	2,184	37.03%	809	2,993
Luca Delle Monache	7/26	24,465	9.00	2.00%		4,404	50.30%	2,215	6,619
Acad Prog Mgr	7/27	25,688	3.00	2.00%	0.24	1,541	51.31%	791	2,332
TBN (FIRO Operations Manager)	7/26	12,250	9.00	10.00%		11,025	50.30%	5,546	16,571
Researcher	7/27	12,863	3.00	10.00%	1.20	3,859	51.31%	1,980	5,839
Kyla Van Maanen	7/26	6,974	9.00	15.00%		9,415	50.30%	4,736	14,151
Proj Policy Analyst	7/27	7,323	3.00	15.00%	1.80	3,295	51.31%	1,691	4,986
Taylor Dixon	7/26	13,644	9.00	5.00%		6,140	50.30%	3,088	9,228
Acad Prog Mgmt Ofr	7/27	14,326	3.00	5.00%	0.60	2,149	51.31%	1,103	3,252
Mahdi Erfani	7/26	8,182	9.00	8.00%		5,891	50.30%	2,963	8,854
Res/Dev Engr	7/27	8,591	3.00	8.00%	0.96	2,062	51.31%	1,058	3,120
Zach Brodeur	7/26	8,345	9.00	5.00%		3,755	50.30%	1,889	5,644
Res/Dev Engr	7/27	8,763	3.00	5.00%	0.60	1,314	51.31%	674	1,988
TBN (Rsch Data Analyst 3, Hydrology)	7/26	8,108	9.00	10.00%		7,297	50.30%	3,670	10,967
Research Data Analyst	7/27	8,514	3.00	10.00%	1.20	2,554	51.31%	1,310	3,864
Ava Cooper	7/26	9,398	9.00	10.00%		8,458	50.30%	4,254	12,712
Research Data Analyst	7/27	9,867	3.00	10.00%	1.20	2,960	51.31%	1,519	4,479
Subin Yoon	7/26	10,675	9.00	10.00%		9,608	50.30%	4,833	14,441
Acad Prog Mgmt Ofr	7/27	11,209	3.00	10.00%	1.20	3,363	51.31%	1,726	5,089
Jeri Wilcox	7/26	6,972	9.00	15.00%		9,412	50.30%	4,734	14,146
Field Researcher	7/27	7,321	3.00	15.00%	1.80	3,294	51.31%	1,690	4,984
John Deane	7/26	8,688	9.00	15.00%		11,729	50.30%	5,900	17,629
Res/Dev Engr	7/27	9,122	3.00	15.00%	1.80	4,105	51.31%	2,106	6,211
Ethan Morris	7/26	10,062	9.00	10.00%		9,056	50.30%	4,555	13,611
Res/Dev Engr	7/27	10,565	3.00	10.00%	1.20	3,170	51.31%	1,627	4,797
TBN (R&D Eng, Obs)	7/26	9,121	9.00	8.00%		6,567	50.30%	3,303	9,870
Res/Dev Engr	7/27	9,577	3.00	8.00%	0.96	2,298	51.31%	1,179	3,477
Ricardo Batista Vilela	7/26	7,520	9.00	5.00%		3,384	50.30%	1,702	5,086
Applications Programmer	7/27	7,896	3.00	5.00%	0.60	1,184	51.31%	608	1,792
Chris Castellano	7/26	9,617	9.00	5.00%		4,328	50.30%	2,177	6,505
Research Data Analyst	7/27	10,098	3.00	5.00%	0.60	1,515	51.31%	777	2,292
TBN (Rsch Data Analyst 3, Met)	7/26	8,752	9.00	5.00%		3,938	50.30%	1,981	5,919
Research Data Analyst	7/27	9,189	3.00	5.00%	0.60	1,378	51.31%	707	2,085
Rachel Weihs	7/26	10,740	9.00	5.00%		4,833	50.30%	2,431	7,264
Research Data Analyst	7/27	11,277	3.00	5.00%	0.60	1,692	51.31%	868	2,560
				Total person months	19.80				
				DIRECT SALARIES TOTAL		193,848			
B. FRINGE BENEFITS							**BENEFITS TOTAL**	96,828	
						SALARIES AND BENEFITS TOTAL			**290,676**

C. TRAVEL	*Airfare/Baggage*	*Car/RF Per Diem*	*No. of Days/Bags*	*No. of Trips*	*Total*	
Domestic						
Steering Committee Meeting (PI)						
RT ALB/SBD	$ 605			3	$ 1,815	
RT Checked Baggage	$ 70		1	3	$ 210	
Rental Car/Ground Transportation		$ 59	3	3	$ 531	
Per Diem (Lodging)		$ 124	3	3	$ 1,116	
Per Diem (Meals)		$ 86	3	3	$ 774	
Steering Committee Meeting (Other SIO)						
RT SAN/SBD						
Mileage		$ 181	1	3	$ 543	
Per Diem (Lodging)		$ 124	2	3	$ 744	
Per Diem (Meals)		$ 86	2	3	$ 516	
Field Work						
RT SAN/SNA						
Mileage		$ 218	1	15	$ 3,270	
Per Diem (Lodging)		$ 191	5	15	$ 14,325	
Per Diem (Meals)		$ 86	5	15	$ 6,450	
			Total Domestic Travel		**30,294**	
Foreign						
Research Lab Collaboration						
RT SD/LHR	$ 1,346			1	$ 1,346	
RT Checked Baggage (2nd bag)	$ 70		1	1	$ 70	
Ground Transportation		$ 65	6	1	$ 390	
Per Diem (Lodging)		$ 424	6	1	$ 2,544	
Per Diem (Meals)		$ 174	6	1	$ 1,044	
			Total Foreign Travel		**5,394**	
			TRAVEL TOTAL			**35,688**

D. EQUIPMENT (or equivalent and includes sales tax)

Fluidless snow pillow		32,688	
Non contact stream gage fabrication		8,600	
	Total Equipment	41,288	
	EQUIPMENT TOTAL		**41,288**

E. SUPPLIES

Field research supplies		10,000	
Telemetry		3,000	
Permitting		1,500	
	SUPPLIES TOTAL		**14,500**

F. CONTRACTUAL

Eastern Research Group (meeting facilitation, report preparation & Section 508 compliance)		12,903	
	SERVICE CONTRACT TOTAL		**12,903**

G. OTHER

Managed Lab Machine (MLM)							10,692	
San Diego Supercomputer Center							10,000	
Catering for Steering Committee Meetings ($500 x 3)							1,500	
Project Specific Communications and Network Costs	FY 26/27	15.75	months @	$	129.47	/month	2,039	
	FY 27/28	5.25	months @	$	135.94	/month	714	
	Total Project Specific Communications and Network Costs						2,753	
						OTHER EXPENSES TOTAL		**24,945**

H. TOTAL DIRECT COSTS **420,000**

I. INDIRECT COSTS (less equipment, tuition remission, subcontract costs in excess of $25K)

Tuition:	*0*	Base	OH Rate	
Equipment:	*41,288*	368,712	60.0%	221,227
SDSC:	*10,000*			
Excluded from Indirect:	*51,288*			

TOTAL INDIRECT COST **221,227**

J. TOTAL AMOUNT REQUESTED **641,227**

UCSD # 82429-2026

Forecast Informed Reservoir Operations (FIRO) at Seven Oaks Dam: Development of the Final Viability Assessment

Year 2: 10/1/27 - 9/30/28

A. SALARIES	FY Rates Beginning	Monthly Direct Salary Rate	No. Months	% Salary or Effort	Person Mos.	Salary Subtotal	Fringe Benefits %	Fringe Benefits Amount	TOTAL
Kyla Semmendinger-Raney (PI)	7/27	10,565	9.00	20.00%		19,017	51.31%	9,758	28,775
Res/Dev Engr	7/28	11,094	3.00	20.00%	2.40	6,656	52.34%	3,484	10,140
Marty Ralph (Co-PI)	7/27	36,400	9.00	2.00%		6,552	37.03%	2,426	8,978
Director/CW3E	7/28	38,220	3.00	2.00%	0.24	2,293	37.77%	866	3,159
Luca Delle Monache	7/27	25,688	9.00	2.00%		4,624	51.31%	2,373	6,997
Acad Prog Mgr	7/28	26,973	3.00	2.00%	0.24	1,618	52.34%	847	2,465
TBN (FIRO Operations Manager)	7/27	12,863	9.00	10.00%		11,577	51.31%	5,940	17,517
Researcher	7/28	13,506	3.00	10.00%	1.20	4,052	52.34%	2,121	6,173
Kyla Van Maanen	7/27	7,323	9.00	15.00%		9,886	51.31%	5,073	14,959
Proj Policy Analyst	7/28	7,689	3.00	15.00%	1.80	3,460	52.34%	1,811	5,271
Taylor Dixon	7/27	14,326	9.00	5.00%		6,447	51.31%	3,308	9,755
Acad Prog Mgmt Ofr	7/28	15,042	3.00	5.00%	0.60	2,256	52.34%	1,181	3,437
Mahdi Erfani	7/27	8,591	9.00	5.00%		3,866	51.31%	1,984	5,850
Res/Dev Engr	7/28	9,020	3.00	5.00%	0.60	1,353	52.34%	708	2,061
Zach Brodeur	7/27	8,763	9.00	5.00%		3,943	51.31%	2,023	5,966
Res/Dev Engr	7/28	9,201	3.00	5.00%	0.60	1,380	52.34%	722	2,102
TBN (Rsch Data Analyst 3, Hydrology)	7/27	8,787	9.00	10.00%		7,908	51.31%	4,058	11,966
Research Data Analyst	7/28	9,226	3.00	10.00%	1.20	2,768	52.34%	1,449	4,217
Ava Cooper	7/27	9,867	9.00	10.00%		8,880	51.31%	4,556	13,436
Research Data Analyst	7/28	10,361	3.00	10.00%	1.20	3,108	52.34%	1,627	4,735
Subin Yoon	7/27	11,209	9.00	10.00%		10,088	51.31%	5,176	15,264
Acad Prog Mgmt Ofr	7/28	11,770	3.00	10.00%	1.20	3,531	52.34%	1,848	5,379
Jeri Wilcox	7/27	7,321	9.00	15.00%		9,883	51.31%	5,071	14,954
Field Researcher	7/28	7,687	3.00	15.00%	1.80	3,459	52.34%	1,810	5,269
John Deane	7/27	9,122	9.00	15.00%		12,315	51.31%	6,319	18,634
Res/Dev Engr	7/28	9,578	3.00	15.00%	1.80	4,310	52.34%	2,256	6,566
Ethan Morris	7/27	10,565	9.00	10.00%		9,509	51.31%	4,879	14,388
Res/Dev Engr	7/28	11,094	3.00	10.00%	1.20	3,328	52.34%	1,742	5,070
TBN (R&D Eng, Obs)	7/27	9,577	9.00	5.00%		4,310	51.31%	2,211	6,521
Res/Dev Engr	7/28	10,056	3.00	5.00%	0.60	1,508	52.34%	789	2,297
Ricardo Batista Vilela	7/27	7,896	9.00	5.00%		3,553	51.31%	1,823	5,376
Applications Programmer	7/28	8,291	3.00	5.00%	0.60	1,244	52.34%	651	1,895
Chris Castellano	7/27	10,098	9.00	5.00%		4,544	51.31%	2,332	6,876
Research Data Analyst	7/28	10,603	3.00	5.00%	0.60	1,590	52.34%	832	2,422
TBN (Rsch Data Analyst 3, Met)	7/27	9,189	9.00	5.00%		4,135	51.31%	2,122	6,257
Research Data Analyst	7/28	9,649	3.00	5.00%	0.60	1,447	52.34%	757	2,204
Rachel Weihs	7/27	11,277	9.00	5.00%		5,075	51.31%	2,604	7,679
Research Data Analyst	7/28	11,841	3.00	5.00%	0.60	1,776	52.34%	930	2,706
				Total person months	19.08				
				DIRECT SALARIES TOTAL		197,249			
B. FRINGE BENEFITS							**BENEFITS TOTAL**	100,467	
						SALARIES AND BENEFITS TOTAL			**297,716**

C. TRAVEL	*Airfare/Baggage*	*Car/RF Per Diem*	*No. of Days/Bags*	*No. of Trips*	*Total*
Domestic					
Steering Committee Meeting (PI)					
RT ALB/SBD	$ 635			3	$ 1,905
RT Checked Baggage	$ 70		1	3	$ 210
Rental Car/Ground Transportation		$ 62	3	3	$ 558
Per Diem (Lodging)		$ 130	3	3	$ 1,170
Per Diem (Meals)		$ 90	3	3	$ 810
Steering Committee Meeting (Other SIO)					
RT SAN/SBD					
Mileage		$ 190	1	3	$ 570
Per Diem (Lodging)		$ 130	2	3	$ 780
Per Diem (Meals)		$ 90	2	3	$ 540
			Total Domestic Travel		**6,543**
Foreign					
Research Lab Collaboration					
RT SD/PER	$ 2,724			1	$ 2,724
RT Checked Baggage (2nd bag)	$ 70		1	1	$ 70
Ground Transportation		$ 82	6	1	$ 492
Per Diem (Lodging)		$ 215	6	1	$ 1,290
Per Diem (Meals)		$ 142	6	1	$ 852
			Total Foreign Travel		**5,428**
			TRAVEL TOTAL		**11,971**

D. EQUIPMENT (or equivalent and includes sales tax)		
Fluidless snow pillow	0	
Non contact stream gage fabrication	0	
Total Equipment	0	
EQUIPMENT TOTAL		**0**

E. SUPPLIES

Field research supplies					0	
Telemetry					0	
Permitting					0	
				SUPPLIES TOTAL		**0**

F. CONTRACTUAL

Eastern Research Group (meeting facilitation, report preparation & Section 508 compliance)	17,711	
SERVICE CONTRACT TOTAL		**17,711**

G. OTHER

Managed Lab Machine (MLM)					10,303	
San Diego Supercomputer Center					10,000	
Catering for Steering Committee Meetings ($500 x 3)					1,500	
Project Specific Communications and Network Costs	FY 27/28	15.21 months @ $	135.94	/month	2,068	
	FY 28/29	5.07 months @ $	142.74	/month	724	
	Total Project Specific Communications and Network Costs				2,792	
				OTHER EXPENSES TOTAL		**24,595**

H. TOTAL DIRECT COSTS **351,993**

I. INDIRECT COSTS (less equipment, tuition remission, subcontract costs in excess of $25K)

Tuition:	*0*	Base	OH Rate	
Equipment:	*0*	341,993	60.0%	205,196
SDSC:	*10,000*			
Excluded from Indirect:	*10,000*			

TOTAL INDIRECT COST **205,196**

J. TOTAL AMOUNT REQUESTED **557,189**

Forecast Informed Reservoir Operations (FIRO) at Seven Oaks Dam:
Development of the Final Viability Assessment

	Year 1	Year 2	TOTAL PROJECT
A. Salaries	193,848	197,249	**391,097**
B. Fringe Benefits	96,828	100,467	**197,295**
C. Travel	35,688	11,971	**47,659**
D. Equipment	41,288	0	**41,288**
E. Supplies	14,500	0	**14,500**
F. Contractual			
Service Contracts	12,903	17,711	**30,614**
G. Other Expenses	24,945	24,595	**49,540**
H. Total Direct Costs	**420,000**	**351,993**	**771,993**
I. Indirect Cost	221,227	205,196	**426,423**
J. Total Amount Requested	**641,227**	**557,189**	**1,198,416**

Budget Justification

A. Salaries: $ 391,097

Kyla Semmendinger-Raney, Ph.D. – PI (Research & Development Engineer, 2.40 person-months/year): Funds are requested to support PI Semmendinger-Raney at 20% each year. She will be responsible for co-leading the overall project to obtain the objectives sought in the proposed project and oversee technical work teams. She will provide progress reports to the co-PI and San Bernardino Valley Municipal Water District management as needed. She will also lead the water resources engineering work team to conduct the engineering analyses needed to support the final viability assessment. She will support work on Task 1, Task 2, Task 3, and Task 4 of the Statement of Work.

Marty Ralph, Ph.D. – Co-PI (Director/CW3E, 0.24 person-months/year): Funds are requested to support Co-PI Ralph at 2% each year. He will co-lead the overall project to obtain the objectives sought in the proposed project. He will serve on the steering committee, and his role also includes the general direction and management of the project and team. He will provide progress reports to the San Bernardino Valley Municipal Water District management as needed..

Luca Delle Monache, Ph.D. (Academic Program Manager, 0.24 person-months/year): Funds are requested to support Dr. Delle Monache at 2% each year. He will provide general direction and oversight of the project research tasks.

TBN FIRO Operations Manager (Researcher, 1.20 person-months/year): Funds are requested to support a TBN FIRO Operations Manager at 10% each year. They will provide general direction to the project, facilitate steering committee meetings, and support development of the FVA report. They will support Task 1 and Task 2 of the Statement of Work.

Kyla Van Maanen (Project Policy Analyst, 1.80 person-months/year): Funds are requested to support Ms. Van Maanen at 15% each year. She will provide management support and coordinate logistics and facilitation of the steering committee meetings, technical work team meetings, and the technical workshop. She will support work on Task 1 and Task 2 of the Statement of Work.

Taylor Dixon, Ph.D. (Academic Program Management Officer, 0.60 person-months/year): Funds are requested to support Dr. Dixon at 5% each year. He will perform work to support hydrology and water resource engineering studies to develop the final viability assessment, as described in Task 3 and Task 4.3 of the Statement of Work.

Mahdi Erfani, Ph.D. (Research & Development Engineer, 0.96 person-months in year 1 and 0.60 person-months in year two): Funds are requested to support PI Erfani at 8% effort in the first year and 5% effort in the second year. He will perform work to support reservoir operations and water resource engineering studies to develop the final viability assessment, as described in Task 3 of the Statement of Work.

Zach Brodeur, Ph.D. (Research & Development Engineer, 0.60 person-months/year): Funds are requested to support Dr. Brodeur at 5% each year. He will perform work to support reservoir operations and water resource engineering studies to develop the final viability assessment, as described in Task 3 of the Statement of Work.

TBN Research Data Analyst (RDA-Hydrology, 1.20 person-months/year): Funds are requested to support a TBN Research Data Analyst (Hydrology) at 10% each year. They will perform work to support hydrologic modeling and forecasting and water resource engineering studies to develop the final viability assessment, as described in Task 3 and Task 4.3 of the Statement of Work.

Ava Cooper (Research Data Analyst, 1.20 person-months/year): Funds are requested to support a Ms. Cooper at 10% each year. She will perform work to support hydrometeorological monitoring stations, meteorological analysis, and forecast verification studies to develop technical studies as described in Task 4.1 and Task 4.2 of the Statement of Work.

Subin Yoon, Ph.D. (Academic Program Management Officer, 1.20 person-months/year): Funds are requested to support a Dr. Yoon at 10% each year. She will perform work to support hydrometeorological monitoring stations, meteorological analysis, and forecast verification studies to develop technical studies as described in Task 4.1 and Task 4.2 of the Statement of Work.

Jeri Wilcox (Field Researcher, 1.80 person-months/year): Funds are requested to support a Ms. Wilcox at 15% each year. She will perform work to support hydrometeorological monitoring stations to develop technical studies as described in Task 4.1 of the Statement of Work.

John Deane (Research & Development Engineer, 1.80 person-months/year): Funds are requested to support Mr. Deane at 15% each year. He will perform work to support hydrometeorological monitoring stations to develop technical studies as described in Task 4.1 of the Statement of Work.

Ethan Morris (Research & Development Engineer, 1.20 person-months/year): Funds are requested to support Mr. Morris at 10% each year. He will perform work to support hydrometeorological monitoring stations to develop technical studies as described in Task 4.1 of the Statement of Work.

TBN Research & Development Engineer (RDE-Obs, 0.96 person-months/year): Funds are requested to support a Research & Development Engineer (Obs) at 8% each year. They will perform work to support hydrometeorological monitoring stations to develop technical studies as described in Task 4.1 of the Statement of Work.

Ricardo Batista Vilela (Applications Programmer, 0.60 person-months/year): Funds are requested to support Mr. Batista Vilela at 5% each year. He will be responsible for will perform work to support hydrometeorological monitoring stations to develop technical studies as described in Task 4.1 of the Statement of Work.

Chris Castellano (Research Data Analyst, 0.60 person-months/year): Funds are requested to support Chris Castellano at 5% each year. He will be responsible for will perform work to support meteorological analysis and forecast verification studies to develop technical studies as described in Task 4.2 of the Statement of Work.

TBN Research Data Analyst (RDA-Met, 0.60 person-months/year): Funds are requested to support a TBN Research Data Analyst (Met) at 5% each year. They will perform work to support meteorological analysis and forecast verification studies to develop technical studies as described in Task 4.2 of the Statement of Work.

Rachel Weihs, Ph.D. (Research Data Analyst, 0.60 person-months/year): Funds are requested to support Dr. Weihs at 5% each year. She will perform work to support meteorological and hydrological analysis and forecast verification studies to develop technical studies as described in Task 4.2 and Task 4.3 of the Statement of Work.

B. Fringe Benefits: $ 197,295

Fringe benefits are requested in accordance with the applicable policies and negotiated rates of UC San Diego and each consortium member. Fringe benefit costs may include employer contributions for health insurance, retirement, payroll taxes, workers compensation, leave accrual, and other institutionally required benefits. Fringe benefits are calculated using the current planning Composite Benefit Rates (CBR) in effect for UC San Diego. CBRs are reviewed and approved by UC San Diego's cognizant Federal agency, the Department of Health and Human Services. Total fringe benefits requested are $1,201,799 over the period of performance. For graduate student researchers, the budget includes tuition and fee remission as required by University policy and allowed under the award, totaling $168,408. For additional information, see https://blink.ucsd.edu/finance/budget/costing-analysis/cbrs/index.html.

C. Travel: $ 47,659

Airfare and ground transportation were obtained by Expedia.com quote; lodging rates and meal/incidental costs were estimated by using University and federally approved rates (e.g., U.S. General Service Administration or U.S. Department of State).

Domestic

In year one, $4,446 ($1,482/trip) is requested for the PI to attend the three, three-day Steering Committee meetings in San Bernadino. Individual travel costs include: Airfare $605, Checked Baggage $70, Ground Transportation $177, Lodging $372, and Meals $258.

During the first year, $1,803 ($601/trip) is requested for one SIO research team member to attend the three, three-day Steering Committee meetings in San Bernadino. Individual travel costs include: Mileage $181, Lodging $248, and Meals $172.

In year one, $24,045 ($1,603/person/trip) is requested for five research team members to travel to Santa Ana for five days, three times/year to conduct field work activities. Individual trip costs include: Mileage $218, Lodging $955, and Meals $430.

During the second year, $4,653 ($1,551/trip) is requested for the PI to attend the three, three-day Steering Committee meetings in San Bernadino. Individual travel costs include: Airfare $635, Checked Baggage $70, Ground Transportation $186, Lodging $390, and Meals $270.

In year two, $1,890 ($630/trip) is requested for one SIO research team member to attend the three, three-day Steering Committee meetings in San Bernadino. Individual travel costs include: Mileage $190, Lodging $260, and Meals $180.

Foreign
In year one, $5,394 is requested for PI or Co-PI to travel to London, England, for six days, for research lab collaboration. Individual trip costs include: Airfare $1,346, Checked Baggage $70, Ground Transportation $390, Lodging $2,544, and Meals $1,044.

During the second year, $5,428 is requested for PI or Co-PI to travel to Lismore, Australia, for six days, for research lab collaboration. Individual trip costs include: Airfare $2,724, Checked Baggage $70, Ground Transportation $492, Lodging $1,290, and Meals $852.

D. Equipment: $ 41,288
In Y1, funds are requested to purchase three fluidless snow pillows at a quoted cost of $10,896 each ($32,688 total) in the first year. These will be used to improve observations of snow in the watershed, which supports Task 4.1. The enhanced monitoring task will fill identified gaps in the observation network to better represent watershed characteristics and hydrometeorological conditions with reliable, near real time monitoring stations.

Funds are also requested, in Y1, for the non-contact stream gage fabrication at a total quoted cost of $8,600 during the first year. This will be built, by UCSD/SIO researchers, to improve observations of streamflow in the watershed (Task 4.1). The remote, rugged nature of the Santa Ana River Canyon renders usual stage-discharge gaging methods incomplete. An optical system provides continuous surface velocity, while a radar measures stage and spot velocity to constrain velocity-based techniques.

E. Supplies: $ 14,500
A total of $14,500 is requested for supplies during the first year. This includes costs associated with field research supplies ($10,000), telemetry ($3,000), and permitting ($1,500). The estimated costs are based on similar items purchased for comparable research projects.

F. Contractual: $ 30,614
A service agreement is planned with Eastern Research Group (ERG) that will provide support for Seven Oaks Dam FIRO Steering Committee (SC) meeting facilitation, support development of final viability assessment, and plan and execute workshops as discussed in Task 1 and Task 2 of Statement of Work. A total of $30,614 is requested to support the subcontract.

G. Other Expenses: $ 49,540
Managed Lab Machine (MLM) – The MLM enhances security for computers used by researchers that are part of the project through Scripps Information Technology (SIO IT) Group. Costs are based on total person-months x $45/month. A total MLM amount requested is $20,995 ($10,692 in year one and $10,303 in year 2).

San Diego Supercomputer Center – The $20,000 ($10,000/year) is requested for use of the San Diego Supercomputer Center (SDSC) at UC San Diego. Services may include high-performance computing, data management, and secure data storage services. Costs associated with use of the SDSC are exempt from indirect costs.

Steering Committee Meeting Costs – Funds are requested for meal catering for the three Steering Committee meetings, scheduled to occur each year, at a total estimated cost of $3,000 or $1,500/year ($25/person x 20 persons/meeting x 3 meetings/year x 2 years = $3,000).

Next Generation Network (NGN) – UC San Diego charges a flat per month fee for services to provide state-of-the-art technology infrastructure and services to the campus community. These charges are directly attributable and proportionally applied for the individual(s) included in the proposed budget on the project. These costs are not included in the campus' Facilities & Administration (F&A) rate as an indirect cost. Auditors have determined that it is both equitable and consistent with the OMB Circular 2 CFR 200 provisions on cost allocability that the costs be assigned to FTE on grant and contract funds. Accordingly, an allocable portion of these NGN costs are included in this budget as direct project costs. Total NGN requested is $5,545 ($2,753 in year one and $ 2,792 in year two).

H. Total Direct Costs: $ 771,993

I. Indirect Costs: $ 426,423

UC San Diego's indirect costs are calculated based on Modified Total Direct Costs (MTDC) as defined in 2 CFR Part 200.68 using Facilities and Administration (F&A) rates approved by the U.S. Department of Health and Human Services (DHHS).

Rates established by UC San Diego's F&A rate agreement dated 06/06/2024, and until amended, are as follows:

- July 1, 2026 to June 30, 2027: 60.0%

J. Total Amount Requested: $ 1,198,416

GEONOR, Inc.
51 U.S. Highway 206, Suite 201
Augusta NJ 07822 USA
Tel: 570-296-4884
Fax: 570-296-4886
geonor@geonor.com
www.geonor.com

QUOTE:	Q10872
DATE:	7/10/2026

VALID FOR 30 DAYS

To:

UCSD (CW3E)
Center for Western
Weather & Water Extremes
Submit invoice via Transcepta

Ship To:

UCSD/Ava Cooper
2485 Downwind Way
Corallina RM 100
La Jolla, CA 92037

Contact	
Phone	936-355-4702
Cust Fax	858-534-8299
Cust E-mail	eknappe@ucsd.edu

Rep Contact	EKK
Pmt. Terms	Net. 30
Trade Terms	EX Factory
Other	

Qty	Part Number	Description	U/M	Unit Price	Total
3.00	FSP5	Fluidless Snow Pillow, 5-ft x 5-ft. Does Not Including Data Logger, Solar Power, Enclosure, and Accessories	ea	10,687.50	32,062.50
	Shipping	Freight, insurance & handling ESTIMATE		625.00	625.00

Please contact us with any questions.
Shipping charges tariffs (if applicable) are prepaid and added to the final invoice.
There is a 3% surcharge on all credit card orders

Total	USD 32,687.50

GEONOR, Inc. sales and rental terms and conditions can be found at http://geonor.com/geonor-inc-general-conditio.pdf
Shipping is not included unless specified.

KISTERS North America, Inc.
616 E. Blanco Rd, Ste 300A
Boerne, Texas, TX 78006
United States of America
Phone No.: +1 916 723 1441
Fax No.: +1 916 774-1520
Email: info@kisters.net

KISTERS North America

Your Contact
David Dalkin

Phone No.
+1 727 452 7725

Email
david.dalkin@kisters.net

Date
3/20/2026

University of California San Diego
Western Weather & Water Extremes (CW3E)
Mr. John Deane
9500 Gilman Drive, MS 0230
La Jolla, CA 92093

Quote SQ-KNA-003518-0

Dear Mr. Deane,

Thank you for your interest in KISTERS products. Please find the attached quote for your review.

We look forward to a successful relationship providing you with high quality environmental data management Solutions.

Sincerely yours,
KISTERS North America, Inc.

David Dalkin

Pos.	Item no./Description	Quantity	Unit of Measure	Price/each	Total
1	MON32_BXSOM22206XXXX SOMMER RG-30+C/15 Combined Surface Velocity and Level Sensor 15m, No Discharge Base Unit RG30	1.00	Piece	7,275.00	7,275.00
2	MON32_AXSOM15833XXXX SOMMER Cable for RQ-30 / RG-30 / SQ / SMA-2, price per meter, up to 60 meters Accessory	60.00	Meter	11.00	660.00
3	MON32_AXSOM15543XXXX SOMMER CONFIGURATION AND TESTING OF CABLE FOR RQ-30/RG-30 Accessory RQ30/RG30	1.00	Piece	475.00	475.00
4	MON32_AXSOM15543XXXX Freight Import freight docs and shipping to final destination	1.00		190.00	190.00
			Total USD		**8,600.00**

Payment Terms 30 days net

All prices are exclusive of the statutory value added tax at the time of invoicing.

Quote valid until 4/27/2026

Delivery only with extended and expanded retention of title.

Please note that minor rounding differences may occur between the unit price and the total sales price due to system-based calculations using five decimal places.

Ship-to Address

University of California San Diego
Mr. John Deane
9500 Gilman Drive, MS 0230
La Jolla, CA 92093

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
RECAP OF DIRECTORS FEES AND EXPENSE REIMBURSEMENT
PAID IN THE MONTH OF JULY 2026

	GIL BOTELLO	MILFORD HARRISON	PAUL KIELHOLD	SUSAN LONGVILLE	JOSE VELASQUEZ
DIRECTOR COMPENSATION - JUNE MEETINGS	2,990.00	2,990.00	2,691.00	2,990.00	2,392.00
EXPENDITURES / REIMBURSEMENTS					
EDUCATION					
ASSOCIATION OF S.B. COUNTY SPECIAL DISTRICT - 5/18/26		40.00			
ASSOCIATION OF S.B. COUNTY SPECIAL DISTRICT - 6/15/26		40.00			
MWDOC WATER POLICY FORUM	195.00				195.00
TRAVEL					
MILEAGE REIMBURSEMENT - MEETINGS OUTSIDE DISTRICT SERVICE AREA					
MILEAGE REIMBURSEMENT - MEETINGS WITHIN DISTRICT SERVICE AREA					
MEALS					
LODGING					
MISCELLANEOUS					

THIS REPORT IS PROVIDED IN ACCORDANCE TO RESOLUTION 1100

EACH BOARD MEMBER SHALL BE PROVIDED WITH A MONTHLY REPORT SHOWING THE AMOUNT OF COMPENSATION OR REIMBURSEMENT REQUESTED BY EACH BOARD MEMBER.

SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

Director's Activity Report

Director's Name Gil J.Botello

Month Reporting Activity July 2026

	Date	Meeting/Activity Description	Explanation Provide description of the meeting or activity and brief explanation on the benefits to the District and work of the Board by your attendance. *(Not required for Valley District meetings)*	Max 10/month	Travel Cost Estimate *(Staff)*
1	07/01/2026	Other	Webinar: Storm Water Capture & Pollution Prevention	$299	
2	07/02/2026	Workshop - Policy/Admin	Valley District	$299	
3	07/07/2026	SB Valley Board Mtg 1	Valley District	$299	
4	07/13/2026	Other	NOAA Webinar: The Ever Present Threat of Flash Drought	$299	
5	07/14/2026	Workshop - Resources/Eng	Valley District	$299	
6	07/15/2026	City Council meeting	City of SB	$299	
7	07/16/2026	Retail Agency Board Meeting	West Valley Board Meeting - Demand Management Check Presentation	$299	
8	07/20/2026	ASBCSD Dinner	Sterling Natural Resources Center	$299	
9	07/21/2026	SB Valley Board Mtg 2	Valley District	$299	
10	07/28/2026	Retail Agency Board Meeting	SBMWD Board Meting Demand Management Check Presentation	$299	
11		Select from List		Per diem?	
12		Select from List		Per diem?	
13		Select from List		Per diem?	
14		Select from List		Per diem?	
15		Select from List		Per diem?	
			Total Requested Compensation	$ 2,990.00	

The undersigned certifies that the claims hereby stated are for authorized activities as described in the District's approved Resolution establishing rules and procedures for compensation of Directors.

Signed: Gil Botello Digitally signed by Gil Botello Date: 2026.07.30 12:08:21 -07'00'

Date: 07/30/2026

Rev. 09/01/20

Director's Activity Report

Director's Name Paul Kielhold

Month Reporting Activity July 2026

	Date	Meeting/Activity Description	Explanation Provide description of the meeting or activity and brief explanation on the benefits to the District and work of the Board by your attendance. *(Not required for Valley District meetings)*	Max 10/month	Travel Cost Estimate *(Staff)*
1	7/2/26	Workshop - Policy		$299	
2	7/7/26	Valley District Board Mtg 1		$299	
3	7/8/26	Retail Agency Board Meeting	EVWD	$299	
4	7/14/26	Workshop - Resources		$299	
5	7/15/26	SBV Water Conservation District Mtg		$299	
6	7/20/26	San Gorgonio Pass Water Agency Mtg		$299	
7	7/21/26	Valley District Board Mtg 2		$299	
8	7/22/26	Other	YSGMA	$299	
9				$0	
10				$0	
11				$0	
12				$0	
13				$0	
14				$0	
15				$0	
			Total Requested Compensation	$2,392.00	$ 0.00

The undersigned certifies that the claims hereby stated are for authorized activities as described in the District's approved Resolution establishing rules and procedures for compensation of Directors.

Signed: Paul Kielhold **Date:** August 7, 2026

Rev. 09/01/20

SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

Director's Activity Report

Director's Name Susan Longville

Month Reporting Activity July 2026

	Date	Meeting/Activity Description	Explanation Provide description of the meeting or activity and brief explanation on the benefits to the District and work of the Board by your attendance. *(Not required for Valley District meetings)*	Max 10/month	Travel Cost Estimate *(Staff)*
1	07/02/2026	Workshop - Policy/Admin	SB Valley Board Meeting	$299	
2	07/07/2026	SB Valley Board Mtg 1		$299	
3	07/08/2026	Other	Video taping for District regarding SBVMWD history	$299	
4	07/09/2026	Assigned Committee Mtg	CA League of Women Voters Water Committee Meeting	$299	
5	07/14/2026	Workshop - Resources/Eng		$299	
6	07/21/2026	SB Valley Board Mtg 2		$299	
7	07/22/2026	SAWPA Mtg	SAWPA Community Meeting at District on Community Meeting at District for Strategic Plan	$299	
8	07/24/2026	Presentation	SWRCB Hearing on Sites Water Right on YouTube	$299	
9	07/28/2026	Retail Agency Board Meeting	Demand Management Check at SBMWD Board Meeting	$299	
10	07/30/2026	Other	Yucaipa Valley Water Yucaipa Valley Water District Dedication Ceremony for new Microgrid and Water Filtration System	$299	
11		Select from List		Per diem?	
12		Select from List		Per diem?	
13		Select from List		Per diem?	
14		Select from List		Per diem?	
15		Select from List		Per diem?	
			Total Requested Compensation	$ 2,990.00	

The undersigned certifies that the claims hereby stated are for authorized activities as described in the District's approved Resolution establishing rules and procedures for compensation of Directors.

Signed: Susan Longville

Date: 08/06/2026

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

Director Request for Compensation & Public Disclosure Form

Director's Name T. Milford Harrison

Month Reporting Activity JULY 2026

	Date	Meeting/Activity Description	Explanation Provide description of the meeting or activity and brief explanation on the benefits to the District and work of the Board by your attendance. *(Not required for Valley District meetings)*	Max 10/month	Travel Cost Estimate *(Staff)*
1	07/01/2026	Chamber of Commerce Mtg	LOMA LINDA CHAMBER OF COMMERCE	$299	
2	07/02/2026	Workshop - Policy	PUBLISHED AGENDA	$299	
3	07/07/2026	Valley District Board Mtg 1	PUBLISHED AGENDA	$299	
4	07/13/2026	CSDA Mtg	ASBCSD BOARD MEETING	$299	
5	07/14/2026	Workshop - Engineering	PUBLISHED AGENDA	$299	
6	07/20/2026	CSDA Mtg	ASBCSD MONTHLY DINNER	$299	
7	07/21/2026	Valley District Board Mtg 2	PUBLISHED AGENDA	$299	
8	07/23/2026	Assigned Committee Mtg	NHCPCPUBLISHED AGENDA	$299	
9	07/28/2026	Chamber of Commerce Mtg	HIGHLAND CHAMBER OF COMMERCE	$299	
10	07/30/2026	Other	TOUR WITH ASSIST. G,M, WEN HUANG – EAST END FACILITIES AND YUCAIPA	$299	
11		Select from List		Per diem?	
12		Select from List		Per diem?	
13		Select from List		Per diem?	
14		Select from List		Per diem?	
15		Select from List		Per diem?	
			Total Requested Compensation	$ 2,990.00	$ 0.00

The undersigned certifies that the claims hereby stated are for authorized activities as described in the District's approved Resolution establishing rules and procedures for compensation of Directors.

Signed: T. Harrison

Date: 08/06/2026

SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1964

Director's Activity Report

Director's Name Jose Velasquez

Month Reporting Activity July 2026

	Date	Meeting/Activity Description	Explanation Provide description of the meeting or activity and brief explanation on the benefits to the District and work of the Board by your attendance. *(Not required for Valley District meetings)*	Max 10/month	Travel Cost Estimate *(Staff)*
1	07/02/2026	Workshop - Policy/Admin	SBV Workshop Policy/Admin	$299	
2	07/14/2026	Workshop - Resources/Eng	SBV Workshop Engineering/Resources	$299	
3	07/20/2026	ASBCSD Dinner	EVWD hosted at Sterling Natural Resource Center Mapping the Future GIS	$299	
4	07/21/2026	SB Valley Board Mtg 2	SBVMWD Regular Board Meeting	$299	
5	07/28/2026	Retail Agency Board Meeting	City of Rialto Council meeting	$299	
6	07/30/2026	Other	Yucaipa Valley Water District Dedication Ceremony of Regional Water Filtration Facility at Crystal Creek	$299	
7		Select from List		Per diem?	
8		Select from List		Per diem?	
9		Select from List		Per diem?	
10		Select from List		Per diem?	
11		Select from List		Per diem?	
12		Select from List		Per diem?	
13		Select from List		Per diem?	
14		Select from List		Per diem?	
15		Select from List		Per diem?	
			Total Requested Compensation	$ 1,794.00	

The undersigned certifies that the claims hereby stated are for authorized activities as described in the District's approved Resolution establishing rules and procedures for compensation of Directors.

Signed: Jose Velasquez Digitally signed by Jose Velasquez Date: 2026.08.07 15:22:42 -07'00'

Date: 08/07/2026

Rev. 09/01/20

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
TREASURER'S REPORT
FOR THE MONTH OF JULY 2026

RECOMMENDATION:
APPROVE THE CASH DISBURSEMENTS FOR THE MONTH OF JULY 2026
FOR THE FOLLOWING FUNDS:

	CURRENT MONTH	FISCAL YEAR TO DATE
STATE WATER CONTRACT FUND	$ 9,307,669.00	$ 9,307,669.00
GENERAL FUND	$ 3,839,628.77	$ 3,839,628.77

STATE WATER CONTRACT FUND
PROFIT AND LOSS BUDGET VS. ACTUAL
FOR THE 1 MONTHS ENDING JULY 31, 2026

		PERIOD ACTUAL	YTD ACTUAL	BUDGET	DIFFERENCE	PCNT
	REVENUE					
49200	INVESTMENT INCOME	2,191,424.76	2,191,424.76	25,000,000.00	22,808,575.24	8.8
49400	SUCCESSOR AGENCY RDA PASS THRU	.00	.00	9,496,000.00	9,496,000.00	.0
49500	RETURN OF RESERVES/BOND COVER	.00	.00	8,300,000.00	8,300,000.00	.0
49660	PROPERTY TAXES	821,354.88	821,354.88	34,046,000.00	33,224,645.12	2.4
	TOTAL REVENUE	3,012,779.64	3,012,779.64	76,842,000.00	73,829,220.36	3.9
	TOTAL SWC REVENUE	3,012,779.64	3,012,779.64	76,842,000.00	73,829,220.36	3.9
	EXPENDITURES					
62800	FIELD IMPROVEMENTS	.00	.00	13,800,000.00	13,800,000.00	.0
63200	LEGAL / FINANCIAL ADVISORY FEE	.00	.00	150,000.00	150,000.00	.0
63800	AUDIT FEES	.00	.00	45,000.00	45,000.00	.0
64100	STATE WATER CONTRACTOR FEES	.00	.00	350,000.00	350,000.00	.0
	DWR PAYMENTS					
66010	CAPITAL COST DELTA	2,050,877.00	2,050,877.00	4,440,198.00	2,389,321.00	46.2
66050	CAPITAL COST TRANSPORTATION	1,871,539.00	1,871,539.00	3,551,627.00	1,680,088.00	52.7
66100	MINIMUM OMP&R TRANSPORTATION	2,359,721.00	2,359,721.00	26,535,100.00	24,175,379.00	8.9
66150	MINIMUM OMP&R DELTA	447,833.00	447,833.00	5,592,514.00	5,144,681.00	8.0
66200	VARIABLE	194,268.00	194,268.00	11,832,000.00	11,637,732.00	1.6
66250	WATER SYSTEM REVENUE BOND	2,347,227.00	2,347,227.00	3,396,352.00	1,049,125.00	69.1
66300	OFF AQUEDUCT VARIABLE	4,174.00	4,174.00	43,542.00	39,368.00	9.6
66350	EAST BRANCH ENLARGEMENT	32,030.00	32,030.00	383,128.00	351,098.00	8.4
66400	EAST BRANCH EXTENSION	.00	.00	15,642,661.00	15,642,661.00	.0
66450	TEHACHAPI 2ND AFTERBAY	.00	.00	393,095.00	393,095.00	.0
66500	SITES RESERVOIR PROJECT	.00	.00	14,180,000.00	14,180,000.00	.0
	TOTAL SWC EXPENDITURES	9,307,669.00	9,307,669.00	100,335,217.00	91,027,548.00	9.3
	NET REVENUE OVER EXPENDITURES	(6,294,889.36)	(6,294,889.36)	(23,493,217.00)	(17,198,327.64)	(26.8)

SAN BERNARDINO VALLEY MUNICIPAL WTR DIST
PROFIT AND LOSS BUDGET VS. ACTUAL
FOR THE 1 MONTHS ENDING JULY 31, 2026

GENERAL FUND

		PERIOD ACTUAL	YTD ACTUAL	BUDGET	DIFFERENCE	PCNT
	REVENUES					
49000	WATER SALES	2,609,732.10	2,609,732.10	11,554,500.00	8,944,767.90	22.6
49200	INVESTMENT INCOME	343,343.89	343,343.89	4,270,000.00	3,926,656.11	8.0
49250	GRANT INCOME	12,277.13	12,277.13	3,700,000.00	3,687,722.87	.3
49290	BASELINE FEEDER CAP. CONTRIB.	.00	.00	482,000.00	482,000.00	.0
49500	OTHER INCOME	39,236.42	39,236.42	7,047,500.00	7,008,263.58	.6
49660	S.B. CO TAXES	219,246.86	219,246.86	16,300,000.00	16,080,753.14	1.4
49770	RIVERSIDE CO TAXES	37.28	37.28	230,000.00	229,962.72	.0
49800	SUCCESSOR AGENCY PASS THROUGH	.00	.00	10,180,000.00	10,180,000.00	.0
49820	LEASE REVENUE	7,716.67	7,716.67	127,100.00	119,383.33	6.1
	TOTAL REVENUES	3,231,590.35	3,231,590.35	53,891,100.00	50,659,509.65	6.0
	TOTAL GENERAL FUND REVENUE	3,231,590.35	3,231,590.35	53,891,100.00	50,659,509.65	6.0

SAN BERNARDINO VALLEY MUNICIPAL WTR DIST
EXPENDITURES WITH COMPARISON TO BUDGET
FOR THE 1 MONTHS ENDING JULY 31, 2026

GENERAL FUND

		PERIOD ACTUAL	YTD ACTUAL	BUDGET	DIFFERENCE	PCNT
	PAYROLL & BENEFITS					
61000	SALARIES	927,714.60	927,714.60	8,000,000.00	7,072,285.40	11.6
61100	OVERTIME	5,661.15	5,661.15	75,000.00	69,338.85	7.6
61140	ON-CALL PAY	635.69	635.69	25,000.00	24,364.31	2.5
61200	DIRECTORS FEES	14,053.00	14,053.00	179,400.00	165,347.00	7.8
61300	PERS RETIREMENT	761,285.40	761,285.40	2,140,000.00	1,378,714.60	35.6
61370	DEFERRED COMPENSATION EXPENSE	.00	.00	31,000.00	31,000.00	.0
61400	PAYROLL TAXES	64,447.19	64,447.19	575,000.00	510,552.81	11.2
61500	HEALTH INSURANCE	106,258.55	106,258.55	1,420,000.00	1,313,741.45	7.5
61600	DENTAL INSURANCE	7,506.87	7,506.87	100,000.00	92,493.13	7.5
61700	VISION, DISABILITY AND LIFE IN	2,537.01	2,537.01	63,000.00	60,462.99	4.0
61800	WORKERS COMP INS	.00	.00	130,000.00	130,000.00	.0
62000	HEALTH/DEPENDENT CARE PLAN	12,561.80	12,561.80	85,000.00	72,438.20	14.8
	TOTAL PAYROLL & BENEFITS	1,902,661.26	1,902,661.26	12,823,400.00	10,920,738.74	14.8
	LONG TERM DEBT					
62300	COP DEBT SERVICE PAYMENTS	.00	.00	230,000.00	230,000.00	.0
62350	INTEREST	.00	.00	2,249,750.00	2,249,750.00	.0
	TOTAL LONG TERM DEBT	.00	.00	2,479,750.00	2,479,750.00	.0
	FIXED ASSET IMPROVEMENTS					
62400	PIPELINE CONTROL SYSTEM	.00	.00	520,000.00	520,000.00	.0
62500	OFFICE EQUIPMENT	17,616.20	17,616.20	394,600.00	376,983.80	4.5
62600	VEHICLE REPLACEMENT	.00	.00	590,000.00	590,000.00	.0
62800	FIELD IMPROVEMENTS	24,269.50	24,269.50	1,085,000.00	1,060,730.50	2.2
62850	LAND / PROPERTY PURCHASE	.00	.00	3,350,000.00	3,350,000.00	.0
	TOTAL FIXED ASSET IMPROVEMENTS	41,885.70	41,885.70	5,939,600.00	5,897,714.30	.7
	OPERATIONS & MAINTENANCE					
62950	PURCHASED WATER	.00	.00	2,870,500.00	2,870,500.00	.0
62970	LOCAL RESOURCES INVESTMENT PRO	.00	.00	1,525,000.00	1,525,000.00	.0
64600	UTILITIES/COMMUNICATIONS	20,964.17	20,964.17	1,485,000.00	1,464,035.83	1.4
64700	MAINTENANCE & REPAIRS	18,230.32	18,230.32	1,335,000.00	1,316,769.68	1.4
64900	FIELD SUPPLIES	4,326.61	4,326.61	40,000.00	35,673.39	10.8
64950	SAFETY TRAINING AND EQUIPMENT	.00	.00	60,000.00	60,000.00	.0
65400	YUCAIPA LAKES	.00	.00	55,000.00	55,000.00	.0
66100	SPREADING GROUNDS MAINTENANCE	.00	.00	570,000.00	570,000.00	.0
	TOTAL OPERATIONS & MAINTENANCE	43,521.10	43,521.10	7,940,500.00	7,896,978.90	.6
	SPECIAL SERVICES					
63200	HOUSE COUNSEL	.00	.00	350,000.00	350,000.00	.0
63300	SPECIAL COUNSEL	.00	.00	1,000,000.00	1,000,000.00	.0
63400	WATERMASTER	.00	.00	132,000.00	132,000.00	.0
63600	CONSULTANTS	8,243.00	8,243.00	3,688,500.00	3,680,257.00	.2
63800	DISTRICT AUDIT	.00	.00	40,000.00	40,000.00	.0
66400	WATER CONSERVATION & EDUCATIO	.00	.00	5,335,000.00	5,335,000.00	.0
66420	SPONSORSHIPS	151,500.00	151,500.00	213,500.00	62,000.00	71.0
66450	EXTERNAL AFFAIRS/STRATEGIC COM	938.01	938.01	608,000.00	607,061.99	.2
67800	ENVIRONMENTAL / HCP	.00	.00	2,480,000.00	2,480,000.00	.0

GENERAL FUND

		PERIOD ACTUAL	YTD ACTUAL	BUDGET	DIFFERENCE	PCNT
67850	HEADWATER RESILIENCE PROGRAM	.00	.00	307,000.00	307,000.00	.0
	TOTAL SPECIAL SERVICES	160,681.01	160,681.01	14,154,000.00	13,993,318.99	1.1
	SPECIAL PROGRAMS					
63500	USGS DATA	.00	.00	2,590,000.00	2,590,000.00	.0
63900	SAWPA	.00	.00	2,953,000.00	2,953,000.00	.0
64500	WATERSTOCK ASSESSMENT	.00	.00	8,000.00	8,000.00	.0
66900	EMERGENCY PREPAREDNESS	.00	.00	10,000.00	10,000.00	.0
68000	LAFCO ANNUAL FUNDING SHARE	30,000.00	30,000.00	30,000.00	.00	100.0
	TOTAL SPECIAL PROGRAMS	30,000.00	30,000.00	5,591,000.00	5,561,000.00	.5
	GENERAL OFFICE					
64300	LIABILITY INS	9,324.78	9,324.78	515,000.00	505,675.22	1.8
64800	OFFICE EXPENSE	1,520.72	1,520.72	80,500.00	78,979.28	1.9
65000	EDUCATION AND TRAINING	80.00	80.00	140,000.00	139,920.00	.1
65200	ELECTION EXPENSE	.00	.00	160,000.00	160,000.00	.0
65300	BANK CHARGES-TRUSTEE FEES	688.70	688.70	25,000.00	24,311.30	2.8
65800	DUES & SUBSCRIPTIONS	147,522.34	147,522.34	950,000.00	802,477.66	15.5
66000	TAXES & LICENSES	4,622.00	4,622.00	93,500.00	88,878.00	4.9
66500	PUBLIC NOTICES	1,362.06	1,362.06	7,500.00	6,137.94	18.2
	TOTAL GENERAL OFFICE	165,120.60	165,120.60	1,971,500.00	1,806,379.40	8.4
	TRAVEL, MEALS & LODGING					
64000	VEHICLE EXPENSE	10,310.86	10,310.86	122,000.00	111,689.14	8.5
64100	TRAVEL	297.16	297.16	75,000.00	74,702.84	.4
64200	MEALS & LODGING	119.86	119.86	65,000.00	64,880.14	.2
	TOTAL TRAVEL, MEALS & LODGING	10,727.88	10,727.88	262,000.00	251,272.12	4.1
	DEPRECIATION					
	DEPRECIATION	.00	.00	.00	.00	.0
	TOTAL FUND EXPENDITURES	2,354,597.55	2,354,597.55	51,161,750.00	48,807,152.45	4.6
	NET REVENUE OVER EXPENDITURES	876,992.80	876,992.80	2,729,350.00	1,852,357.20	32.1

INVESTMENT DESCRIPTION	SECURITY TYPE	INSTITUTION	MATURITY DATE	PAR VALUE	SETTLEMENT DATE	PURCHASE PRICE	ACCRUED INTEREST	MARKET VALUE	BOOK YIELD RATE	CUSIP
STATE WATER CONTRACT FUND										
GMCAR 263 A2A	ABS	BNY MELLON	05/16/2029	995,000.00	07/15/2026	994,974.13	1,892.71	994,616.23	4.504%	362546AB9
COMET 2026-1 A	ABS	BNY MELLON	07/16/2029	3,470,000.00	07/16/2026	3,469,193.57	6,477.33	3,463,214.76	4.530%	14041NGJ4
HALST 26C A3	ABS	BNY MELLON	07/16/2029	1,540,000.00	07/29/2026	1,539,715.72	400.40	1,539,300.07	4.687%	44935LAD3
PILOT 2026-1 A3	ABS	BNY MELLON	08/20/2029	780,000.00	06/12/2026	779,980.34	1,051.05	778,799.97	4.717%	73328FAD0
HART 26B A3	ABS	BNY MELLON	02/18/2031	1,725,000.00	06/17/2026	1,724,791.79	3,457.67	1,724,034.52	4.557%	44935KAD5
FORDO 26B A3	ABS	BNY MELLON	02/18/2031	1,785,000.00	06/23/2026	1,784,937.53	3,482.73	1,777,884.99	4.432%	34536DAD5
TAOT 2026-C A3	ABS	BNY MELLON	03/17/2031	1,795,000.00	07/21/2026	1,794,739.01	2,248.74	1,791,189.57	4.803%	89231DAD7
BNP PARIBAS NEW YORK BRANCH	CD	BNY MELLON	08/06/2026	4,000,000.00	08/07/2025	4,000,000.00	167,134.44	4,000,223.76	4.190%	05593DJE4
CREDIT AGRICOLE CORPORATE AND INVESTMENT BANK, N	CD	BNY MELLON	02/01/2027	2,250,000.00	02/05/2024	2,250,000.00	52,657.50	2,256,368.81	4.760%	22536DWD6
GOLDMAN SACHS GROUP INC	CN	BNY MELLON	11/16/2026	1,000,000.00	11/13/2023	935,210.00	7,291.67	997,840.00	5.881%	38145GAH3
MERCEDES-BENZ FINANCE NORTH AMERICA LLC	CN	BNY MELLON	01/11/2027	1,500,000.00	01/11/2024	1,498,470.00	4,000.00	1,502,715.00	4.837%	58769JAQ0
BMW US CAPITAL LLC	CN	BNY MELLON	04/02/2027	1,500,000.00	04/02/2024	1,498,215.00	24,295.83	1,503,915.00	4.943%	05565ECH6
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	05/14/2027	680,000.00	05/15/2025	679,694.00	6,545.00	681,217.20	4.524%	89236TNG6
NATIONAL SECURITIES CLEARING CORP	CN	BNY MELLON	05/20/2027	760,000.00	05/20/2025	759,323.60	6,520.17	760,532.00	4.397%	637639AN5
CITIBANK NA	CN	BNY MELLON	05/29/2027	1,725,000.00	05/29/2025	1,725,000.00	13,594.53	1,729,812.75	4.576%	17325FBN7
USAA CAPITAL CORP	CN	BNY MELLON	06/01/2027	1,290,000.00	06/03/2024	1,286,271.90	11,287.50	1,299,313.80	5.356%	90327QD97
NATIONAL AUSTRALIA BANK LTD (NEW YORK BRANCH)	CN	BNY MELLON	06/11/2027	805,000.00	06/11/2024	805,000.00	5,687.55	810,224.45	5.087%	63253QAJ3
AMERICAN HONDA FINANCE CORP	CN	BNY MELLON	07/09/2027	900,000.00	07/10/2024	898,839.00	2,695.00	903,321.00	4.947%	02665WFK2
UNILEVER CAPITAL CORP	CN	BNY MELLON	08/12/2027	460,000.00	08/12/2024	458,771.80	9,177.64	459,549.20	4.346%	904764BU0
MERCK & CO INC	CN	BNY MELLON	09/15/2027	1,500,000.00	09/09/2025	1,498,575.00	21,816.67	1,491,930.00	3.899%	58933YBP9
NATIONAL RURAL UTILITIES COOPERATIVE FINANCE CORP	CN	BNY MELLON	09/16/2027	535,000.00	09/16/2024	535,000.00	8,265.75	533,015.15	4.120%	63743HFT4
AUSTRALIA AND NEW ZEALAND BANKING GROUP LTD (NEW	CN	BNY MELLON	09/30/2027	660,000.00	09/30/2024	660,000.00	8,693.65	656,502.00	4.000%	05253JB42
ACCENTURE CAPITAL INC	CN	BNY MELLON	10/04/2027	470,000.00	10/04/2024	469,393.70	5,957.25	467,227.00	3.946%	00440KAA1
JPMORGAN CHASE & CO	CN	BNY MELLON	10/22/2027	605,000.00	10/23/2023	605,000.00	10,098.96	607,105.40	5.203%	46647PDW3
PFIZER INC	CN	BNY MELLON	11/15/2027	765,000.00	11/21/2025	764,915.85	6,258.13	760,341.15	3.881%	717081FJ7
BP CAPITAL MARKETS AMERICA INC	CN	BNY MELLON	11/17/2027	1,630,000.00	05/17/2024	1,630,000.00	16,809.74	1,641,230.70	5.017%	10373QBY5
NATIONAL RURAL UTILITIES COOPERATIVE FINANCE CORP	CN	BNY MELLON	12/10/2027	1,975,000.00	12/10/2025	1,973,538.50	11,051.77	1,961,115.75	3.989%	63743HGB2
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	01/12/2028	1,050,000.00	01/12/2026	1,049,118.00	2,078.13	1,039,899.00	3.794%	89236TPF6
MASTERCARD INC	CN	BNY MELLON	01/15/2028	690,000.00	09/05/2024	689,620.50	1,257.33	687,364.20	4.119%	57636QBA1
ADOBE INC	CN	BNY MELLON	01/17/2028	1,400,000.00	01/17/2025	1,399,258.00	2,586.11	1,405,544.00	4.769%	00724PAH2
NATIONAL RURAL UTILITIES COOPERATIVE FINANCE CORP	CN	BNY MELLON	02/07/2028	415,000.00	02/07/2025	414,817.40	9,527.71	415,896.40	4.766%	63743HFW7
PEPSICO INC	CN	BNY MELLON	02/07/2028	745,000.00	02/07/2025	744,687.10	16,023.71	745,432.10	4.465%	713448GA0
ELI LILLY AND CO	CN	BNY MELLON	02/12/2028	560,000.00	02/12/2025	559,641.60	11,961.44	561,120.00	4.573%	532457CU0
HERSHEY CO	CN	BNY MELLON	02/24/2028	640,000.00	02/24/2025	639,558.40	12,699.56	641,433.60	4.575%	427866BK3
CHEVRON USA INC	CN	BNY MELLON	02/26/2028	1,850,000.00	02/26/2025	1,850,000.00	35,644.62	1,851,350.50	4.475%	166756BB1
MARS INC	CN	BNY MELLON	03/01/2028	585,000.00	03/12/2025	584,994.15	11,212.50	585,040.95	4.601%	571676AX3
PACCAR FINANCIAL CORP	CN	BNY MELLON	03/03/2028	1,575,000.00	03/03/2025	1,574,039.25	29,461.25	1,577,425.50	4.572%	69371RT63
ABBVIE INC	CN	BNY MELLON	03/03/2028	970,000.00	03/04/2026	969,670.20	14,952.15	959,233.00	3.793%	00287YED7
MASTERCARD INC	CN	BNY MELLON	03/15/2028	600,000.00	02/27/2025	599,544.00	10,313.33	600,504.00	4.576%	57636QBF0
SALESFORCE INC	CN	BNY MELLON	03/15/2028	2,845,000.00	03/13/2026	2,842,724.00	49,076.25	2,837,546.10	4.542%	79466LAQ7
BMW US CAPITAL LLC	CN	BNY MELLON	03/17/2028	1,950,000.00	03/19/2026	1,949,083.50	30,745.00	1,937,656.50	4.325%	05565EDF9
BMW US CAPITAL LLC	CN	BNY MELLON	03/21/2028	670,000.00	03/21/2025	669,665.00	11,492.36	670,375.20	4.768%	05565ECW3
ADVANCED MICRO DEVICES INC	CN	BNY MELLON	03/24/2028	1,200,000.00	03/24/2025	1,200,000.00	18,283.77	1,196,688.00	4.319%	007903BJ5
MORGAN STANLEY	CN	BNY MELLON	04/13/2028	270,000.00	04/19/2024	270,000.00	4,578.12	272,016.90	5.090%	61747YFP5
JPMORGAN CHASE & CO	CN	BNY MELLON	04/22/2028	1,385,000.00	04/22/2024	1,385,000.00	21,218.55	1,394,307.20	5.018%	46647PEE2
STATE STREET CORP	CN	BNY MELLON	04/24/2028	555,000.00	04/24/2025	555,000.00	6,793.68	555,083.25	4.586%	857477DA8
CINTAS CORPORATION NO 2	CN	BNY MELLON	05/01/2028	945,000.00	05/02/2025	943,790.40	9,922.50	938,422.80	4.246%	17252MAR1
CUMMINS INC	CN	BNY MELLON	05/09/2028	165,000.00	05/09/2025	164,884.50	1,597.29	164,325.15	4.275%	231021AY2
WESTPAC BANKING CORPORATION (NEW YORK BRANCH)	CN	BNY MELLON	05/11/2028	875,000.00	05/14/2026	874,457.50	7,766.84	870,520.00	4.183%	9612EVAA7
SERVICENOW INC	CN	BNY MELLON	05/15/2028	210,000.00	05/15/2026	209,239.80	1,884.17	208,819.80	4.441%	81762PAF9
GILEAD SCIENCES, INC	CN	BNY MELLON	05/20/2028	1,310,000.00	05/20/2026	1,309,449.80	10,980.35	1,304,222.90	4.272%	375558CJ0
MORGAN STANLEY BANK NA	CN	BNY MELLON	05/26/2028	520,000.00	05/30/2024	520,000.00	5,167.64	523,437.20	4.982%	61690U8B9
USAA CAPITAL CORP	CN	BNY MELLON	06/01/2028	470,000.00	06/02/2025	469,111.70	3,427.08	467,964.90	4.443%	90327QDA4
HSBC USA INC	CN	BNY MELLON	06/03/2028	310,000.00	06/03/2025	309,854.30	2,322.42	310,195.30	4.667%	40428HR95
JOHN DEERE CAPITAL CORP	CN	BNY MELLON	06/05/2028	785,000.00	06/05/2025	784,301.35	5,189.72	782,315.30	4.282%	24422EYD5
NATIONAL SECURITIES CLEARING CORP	CN	BNY MELLON	06/09/2028	1,315,000.00	06/09/2026	1,314,171.55	8,262.58	1,310,384.35	4.383%	637639AR6
TARGET CORP	CN	BNY MELLON	06/15/2028	405,000.00	06/10/2025	404,995.95	2,251.13	404,032.05	4.350%	87612EBU9
ANALOG DEVICES INC	CN	BNY MELLON	06/15/2028	1,770,000.00	06/16/2025	1,768,088.40	9,612.08	1,761,681.00	4.289%	032654BD6
BANK OF NEW YORK MELLON CORP	CN	BNY MELLON	07/21/2028	1,250,000.00	07/22/2024	1,250,000.00	1,697.92	1,253,800.00	4.704%	06406RBX4
PNC BANK NA (DELAWARE)	CN	BNY MELLON	07/21/2028	470,000.00	07/21/2025	470,000.00	578.23	469,050.60	4.414%	69353RFZ6
TRUIST BANK	CN	BNY MELLON	07/24/2028	800,000.00	07/24/2025	800,000.00	687.56	797,936.00	4.468%	89788JAF6
AMERICAN EXPRESS CO	CN	BNY MELLON	07/26/2028	300,000.00	07/26/2024	300,000.00	210.13	301,311.00	5.047%	025816DV8
HOME DEPOT INC	CN	BNY MELLON	09/15/2028	315,000.00	09/15/2025	314,795.25	4,462.50	310,671.90	3.773%	437076DH2
NOVARTIS CAPITAL CORP	CN	BNY MELLON	11/05/2028	880,000.00	11/05/2025	879,806.40	8,198.67	869,044.00	3.908%	66989HAX6
NOVARTIS CAPITAL CORP	CN	BNY MELLON	11/05/2028	650,000.00	11/05/2025	650,019.50	6,055.83	641,907.50	3.900%	66989HAX6
PACCAR FINANCIAL CORP	CN	BNY MELLON	11/07/2028	360,000.00	11/07/2025	359,798.40	3,360.00	355,705.20	4.020%	69371RU20
CATERPILLAR FINANCIAL SERVICES CORP	CN	BNY MELLON	11/14/2028	1,500,000.00	11/14/2025	1,499,205.00	12,672.92	1,481,820.00	3.969%	14913UBD1
MORGAN STANLEY PRIVATE BANK NA	CN	BNY MELLON	11/17/2028	800,000.00	11/19/2025	800,000.00	6,913.24	795,000.00	4.307%	61776NZU0
AMAZON.COM INC	CN	BNY MELLON	11/20/2028	1,010,000.00	11/20/2025	1,009,777.80	7,768.58	993,456.20	3.908%	023135CS3
JOHN DEERE CAPITAL CORP	CN	BNY MELLON	01/18/2029	960,000.00	04/28/2026	959,510.40	1,430.00	950,985.60	4.147%	24422EYM5
JPMORGAN CHASE & CO	CN	BNY MELLON	01/24/2029	500,000.00	01/24/2025	500,000.00	477.85	501,670.00	4.744%	46647PEU6
BANK OF AMERICA CORP	CN	BNY MELLON	01/24/2029	1,395,000.00	01/24/2025	1,395,000.00	1,350.55	1,399,938.30	4.795%	06051GMK2
PNC FINANCIAL SERVICES GROUP INC	CN	BNY MELLON	01/26/2029	1,320,000.00	01/26/2026	1,320,000.00	747.08	1,307,130.00	4.078%	693475CG8
PACCAR FINANCIAL CORP	CN	BNY MELLON	02/05/2029	670,000.00	02/05/2026	669,718.60	12,774.67	659,594.90	3.915%	69371RU38
ALPHABET INC	CN	BNY MELLON	02/15/2029	290,000.00	02/13/2026	288,947.30	5,007.33	283,863.60	3.829%	02079KBJ5
ABBOTT LABORATORIES	CN	BNY MELLON	03/09/2029	2,010,000.00	03/09/2026	2,007,447.30	29,334.83	1,962,765.00	3.745%	002824BR0
JOHN DEERE CAPITAL CORP	CN	BNY MELLON	03/09/2029	655,000.00	03/10/2026	654,122.30	10,005.13	643,688.15	3.948%	24422EYK9
MERCEDES-BENZ FINANCE NORTH AMERICA LLC	CN	BNY MELLON	03/10/2029	945,000.00	03/10/2026	944,603.10	15,730.31	929,889.45	4.265%	58769JBP1
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	03/13/2029	1,785,000.00	03/13/2026	1,784,357.40	27,712.13	1,759,403.10	4.063%	89236TPQ2
AMAZON.COM INC	CN	BNY MELLON	03/13/2029	2,105,000.00	03/13/2026	2,104,768.45	32,276.67	2,068,183.55	4.004%	023135DC7
MERCK & CO INC	CN	BNY MELLON	03/15/2029	480,000.00	12/04/2025	479,289.60	6,981.33	471,734.40	3.900%	58933YBW4
BANK OF NEW YORK MELLON	CN	BNY MELLON	04/20/2029	250,000.00	04/22/2025	250,000.00	3,316.87	250,425.00	4.756%	06405LAH4
AMERICAN EXPRESS CO	CN	BNY MELLON	04/25/2029	1,095,000.00	04/25/2025	1,095,000.00	13,814.52	1,095,295.65	4.734%	025816ED7
WELLS FARGO & CO	CN	BNY MELLON	05/20/2029	1,625,000.00	05/20/2026	1,625,000.00	14,668.65	1,618,792.50	4.581%	95000U4H3
GILEAD SCIENCES, INC	CN	BNY MELLON	05/20/2029	1,220,000.00	05/20/2026	1,219,768.20	10,586.89	1,211,374.60	4.407%	375558CK7
GOLDMAN SACHS BANK USA	CN	BNY MELLON	06/03/2029	660,000.00	06/03/2026	660,000.00	4,950.88	658,006.80	4.566%	38151LAJ9
MASTERCARD INC	CN	BNY MELLON	06/08/2029	3,575,000.00	06/08/2026	3,574,320.75	23,289.64	3,552,441.75	4.432%	57636QBK9
NVIDIA CORP	CN	BNY MELLON	06/15/2029	2,000,000.00	06/18/2026	1,999,060.00	10,391.67	1,979,520.00	4.367%	67066GAQ7
CITIBANK NA	CN	BNY MELLON	06/18/2029	2,225,000.00	06/18/2026	2,225,000.00	12,102.89	2,216,478.25	4.457%	17325FBT4
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	07/09/2029	2,000,000.00	07/09/2026	1,997,220.00	5,500.00	1,988,040.00	4.550%	89236TQD0
AMAZON.COM INC	CN	BNY MELLON	07/09/2029	1,425,000.00	07/09/2026	1,424,601.00	4,005.83	1,419,414.00	4.610%	023135EB8
ACCENTURE CAPITAL INC	CN	BNY MELLON	07/10/2029	680,000.00	07/10/2026	679,884.40	1,884.17	679,258.80	4.756%	00440KAF0
AMERICAN EXPRESS CO	CN	BNY MELLON	07/20/2029	950,000.00	07/25/2025	950,000.00	1,263.00	944,110.00	4.354%	025816EJ4
WELLS FARGO & CO	CN	BNY MELLON	09/15/2029	1,125,000.00	09/15/2025	1,125,000.00	17,331.50	1,107,663.75	4.222%	95000U4A8
MORGAN STANLEY	CN	BNY MELLON	10/18/2029	1,155,000.00	10/22/2025	1,155,000.00	13,657.84	1,136,531.55	4.266%	61748UAK8
TRUIST BANK	CN	BNY MELLON	10/23/2029	2,020,000.00	10/23/2025	2,020,000.00	22,743.40	1,989,821.20	4.267%	89788JAH2

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SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
INVESTMENT SUMMARY
JULY 31, 2026

INVESTMENT DESCRIPTION	SECURITY TYPE	INSTITUTION	MATURITY DATE	PAR VALUE	SETTLEMENT DATE	PURCHASE PRICE	ACCRUED INTEREST	MARKET VALUE	BOOK YIELD RATE	CUSIP
BANK OF NEW YORK MELLON CORP	CN	BNY MELLON	01/22/2030	405,000.00	01/22/2026	405,000.00	407.63	398,021.85	4.102%	06406RCG0
WELLS FARGO & CO	CN	BNY MELLON	01/23/2030	570,000.00	01/23/2026	570,000.00	529.72	560,486.70	4.245%	95000U4D2
GOLDMAN SACHS GROUP INC	CN	BNY MELLON	04/20/2030	785,000.00	04/20/2026	785,000.00	10,117.65	776,113.80	4.610%	38141GE83
JPMORGAN CHASE & CO	CN	BNY MELLON	04/23/2030	1,555,000.00	04/23/2026	1,555,000.00	18,659.31	1,533,090.05	4.428%	46647PFL5
BANK OF AMERICA CORP	CN	BNY MELLON	04/23/2030	695,000.00	04/23/2026	695,000.00	8,470.24	687,028.35	4.492%	06051GMY2
CHARLES SCHWAB CORP	CN	BNY MELLON	05/21/2030	415,000.00	05/21/2026	415,000.00	3,828.14	413,941.75	4.671%	808513CQ6
TRUIST FINANCIAL CORP	CN	BNY MELLON	07/23/2030	645,000.00	07/23/2026	645,000.00	710.50	643,529.40	4.862%	89788MAZ5
FHMS K-1503 A2	FHLMC	BNY MELLON	03/25/2029	2,190,000.00	07/30/2026	2,120,878.13	6,011.55	2,121,397.37	4.585%	3137BXHB1
FHMS K-102 A2	FHLMC	BNY MELLON	10/25/2029	1,745,000.00	07/30/2026	1,639,550.20	3,689.22	1,639,099.44	4.593%	3137FQKC6
FNA 2026-M12 A	FNMA	BNY MELLON	12/25/2030	2,500,000.00	07/31/2026	2,313,671.88	4,585.42	2,500,000.00	4.015%	3136G6G36
LOS ANGELES CALIF UNI SCH DIST	MUNI	BNY MELLON	07/01/2027	1,005,000.00	05/13/2025	1,005,000.00	3,669.93	1,006,155.75	4.378%	544647KX7
UNITED STATES TREASURY	US	BNY MELLON	09/15/2027	4,800,000.00	09/27/2024	4,788,000.00	61,190.22	4,756,896.00	3.464%	91282CLL3
UNITED STATES TREASURY	US	BNY MELLON	09/15/2027	3,500,000.00	10/04/2024	3,485,781.25	44,617.87	3,468,570.00	3.521%	91282CLL3
UNITED STATES TREASURY	US	BNY MELLON	09/15/2027	3,000,000.00	10/04/2024	2,983,359.38	38,243.89	2,973,060.00	3.574%	91282CLL3
UNITED STATES TREASURY	US	BNY MELLON	10/15/2027	500,000.00	10/21/2024	500,000.00	5,717.21	497,970.00	3.875%	91282CLQ2
UNITED STATES TREASURY	US	BNY MELLON	10/15/2027	2,250,000.00	10/29/2024	2,236,289.06	25,727.46	2,240,865.00	4.095%	91282CLQ2
UNITED STATES TREASURY	US	BNY MELLON	10/15/2027	4,750,000.00	11/04/2024	4,713,818.36	54,313.52	4,730,715.00	4.152%	91282CLQ2
UNITED STATES TREASURY	US	BNY MELLON	10/15/2027	4,000,000.00	11/07/2024	3,967,812.50	45,737.70	3,983,760.00	4.168%	91282CLQ2
UNITED STATES TREASURY	US	BNY MELLON	10/31/2027	4,000,000.00	11/12/2025	3,993,437.50	35,380.43	3,964,360.00	3.587%	91282CPE5
UNITED STATES TREASURY	US	BNY MELLON	11/15/2027	3,125,000.00	12/06/2024	3,121,215.82	27,322.52	3,120,375.00	4.168%	91282CLX7
UNITED STATES TREASURY	US	BNY MELLON	11/15/2027	3,000,000.00	12/10/2024	3,002,109.38	26,229.62	2,995,560.00	4.098%	91282CLX7
UNITED STATES TREASURY	US	BNY MELLON	11/15/2027	3,125,000.00	12/16/2024	3,125,122.07	27,322.52	3,120,375.00	4.122%	91282CLX7
UNITED STATES TREASURY	US	BNY MELLON	11/30/2027	3,150,000.00	12/18/2024	3,121,083.98	20,677.25	3,135,100.50	4.208%	91282CFZ9
UNITED STATES TREASURY	US	BNY MELLON	12/15/2027	4,000,000.00	12/26/2024	3,960,625.00	20,546.45	3,987,040.00	4.357%	91282CMB4
UNITED STATES TREASURY	US	BNY MELLON	01/15/2028	3,150,000.00	01/15/2025	3,142,248.05	6,184.44	3,149,275.50	4.338%	91282CMF5
UNITED STATES TREASURY	US	BNY MELLON	01/15/2028	3,150,000.00	02/06/2025	3,148,646.48	6,184.44	3,149,275.50	4.265%	91282CMF5
UNITED STATES TREASURY	US	BNY MELLON	01/31/2028	5,000,000.00	01/12/2026	5,000,195.31	475.54	4,944,550.00	3.497%	91282CGH8
UNITED STATES TREASURY	US	BNY MELLON	02/15/2028	4,000,000.00	02/10/2025	3,834,531.25	50,745.86	3,910,000.00	4.226%	9128283W8
UNITED STATES TREASURY	US	BNY MELLON	03/15/2028	6,750,000.00	03/25/2025	6,723,105.47	98,796.71	6,708,082.50	4.018%	91282CMS7
UNITED STATES TREASURY	US	BNY MELLON	03/15/2028	3,150,000.00	04/10/2025	3,165,257.81	46,105.13	3,130,438.50	3.698%	91282CMS7
UNITED STATES TREASURY	US	BNY MELLON	04/15/2028	5,150,000.00	05/06/2025	5,143,160.15	56,987.70	5,104,937.50	3.797%	91282CMW8
UNITED STATES TREASURY	US	BNY MELLON	04/30/2028	2,000,000.00	04/30/2026	1,994,609.38	18,953.80	1,982,260.00	3.891%	91282CQL8
UNITED STATES TREASURY	US	BNY MELLON	04/30/2028	3,000,000.00	05/13/2026	2,991,328.13	28,430.71	2,973,390.00	3.904%	91282CQL8
UNITED STATES TREASURY	US	BNY MELLON	04/30/2028	2,225,000.00	05/18/2026	2,214,831.05	21,086.11	2,205,264.25	3.995%	91282CQL8
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	2,250,000.00	05/15/2025	2,248,417.97	17,883.83	2,229,165.00	3.775%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	3,000,000.00	05/15/2025	2,980,429.69	23,845.11	2,972,220.00	3.983%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	6,000,000.00	06/04/2025	5,973,281.25	47,690.22	5,944,440.00	3.911%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	3,150,000.00	06/10/2025	3,139,171.88	25,037.36	3,120,831.00	3.874%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	3,000,000.00	06/10/2025	2,979,843.75	23,845.11	2,972,220.00	3.995%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/31/2028	6,000,000.00	06/04/2026	5,996,484.38	40,655.74	5,969,520.00	4.031%	91282CQS3
UNITED STATES TREASURY	US	BNY MELLON	05/31/2028	4,000,000.00	06/04/2026	3,994,687.50	27,103.83	3,979,680.00	4.070%	91282CQS3
UNITED STATES TREASURY	US	BNY MELLON	05/31/2028	3,250,000.00	06/09/2026	3,241,748.05	22,021.86	3,233,490.00	4.135%	91282CQS3
UNITED STATES TREASURY	US	BNY MELLON	06/15/2028	3,225,000.00	07/07/2025	3,236,589.84	16,047.90	3,200,941.50	3.744%	91282CNH0
UNITED STATES TREASURY	US	BNY MELLON	06/15/2028	3,000,000.00	07/07/2025	3,008,789.06	14,928.28	2,977,620.00	3.768%	91282CNH0
UNITED STATES TREASURY	US	BNY MELLON	06/15/2028	3,000,000.00	07/09/2025	3,010,781.25	14,928.28	2,977,620.00	3.744%	91282CNH0
UNITED STATES TREASURY	US	BNY MELLON	07/15/2028	2,400,000.00	07/17/2025	2,400,562.50	4,296.20	2,380,968.00	3.867%	91282CNM9
UNITED STATES TREASURY	US	BNY MELLON	07/15/2028	4,200,000.00	08/04/2025	4,198,359.38	7,518.34	4,166,694.00	3.889%	91282CNM9
UNITED STATES TREASURY	US	BNY MELLON	08/15/2028	650,000.00	08/15/2025	648,146.48	10,869.99	641,446.00	3.726%	91282CNU1
UNITED STATES TREASURY	US	BNY MELLON	08/15/2028	3,250,000.00	09/05/2025	3,250,126.95	54,349.97	3,207,230.00	3.623%	91282CNU1
UNITED STATES TREASURY	US	BNY MELLON	08/15/2028	7,000,000.00	09/08/2025	7,021,601.56	117,061.46	6,907,880.00	3.513%	91282CNU1
UNITED STATES TREASURY	US	BNY MELLON	09/15/2028	6,500,000.00	09/19/2025	6,468,515.63	82,861.75	6,377,345.00	3.547%	91282CNY3
UNITED STATES TREASURY	US	BNY MELLON	09/15/2028	3,325,000.00	09/26/2025	3,298,633.79	42,386.97	3,262,257.25	3.659%	91282CNY3
UNITED STATES TREASURY	US	BNY MELLON	10/15/2028	1,750,000.00	10/15/2025	1,745,419.92	18,073.77	1,719,847.50	3.593%	91282CPC9
UNITED STATES TREASURY	US	BNY MELLON	10/15/2028	1,000,000.00	10/28/2025	999,960.94	10,327.87	982,770.00	3.501%	91282CPC9
UNITED STATES TREASURY	US	BNY MELLON	10/15/2028	3,500,000.00	11/07/2025	3,491,933.59	36,147.54	3,439,695.00	3.583%	91282CPC9
UNITED STATES TREASURY	US	BNY MELLON	10/15/2028	3,350,000.00	11/12/2025	3,340,970.70	34,598.36	3,292,279.50	3.597%	91282CPC9
UNITED STATES TREASURY	US	BNY MELLON	11/15/2028	3,400,000.00	10/08/2025	3,352,453.13	22,520.38	3,311,804.00	3.605%	9128285M8
UNITED STATES TREASURY	US	BNY MELLON	11/15/2028	1,500,000.00	11/18/2025	1,496,308.59	11,127.72	1,472,985.00	3.587%	91282CPK1
UNITED STATES TREASURY	US	BNY MELLON	11/15/2028	2,525,000.00	12/04/2025	2,521,547.85	18,731.66	2,479,524.75	3.549%	91282CPK1
UNITED STATES TREASURY	US	BNY MELLON	11/15/2028	2,500,000.00	12/04/2025	2,497,265.63	18,546.20	2,454,975.00	3.539%	91282CPK1
UNITED STATES TREASURY	US	BNY MELLON	11/15/2028	3,675,000.00	12/08/2025	3,668,683.59	27,262.91	3,608,813.25	3.562%	91282CPK1
UNITED STATES TREASURY	US	BNY MELLON	12/15/2028	750,000.00	12/15/2025	746,835.94	3,370.90	736,027.50	3.650%	91282CPP0
UNITED STATES TREASURY	US	BNY MELLON	12/15/2028	4,000,000.00	01/13/2026	3,995,156.25	17,978.14	3,925,480.00	3.543%	91282CPP0
UNITED STATES TREASURY	US	BNY MELLON	12/15/2028	2,000,000.00	01/12/2026	1,996,718.75	8,989.07	1,962,740.00	3.559%	91282CPP0
UNITED STATES TREASURY	US	BNY MELLON	12/15/2028	800,000.00	01/15/2026	797,875.00	3,595.63	785,096.00	3.596%	91282CPP0
UNITED STATES TREASURY	US	BNY MELLON	01/15/2029	1,625,000.00	01/26/2026	1,617,255.86	2,627.38	1,593,458.75	3.671%	91282CPT2
UNITED STATES TREASURY	US	BNY MELLON	01/15/2029	3,375,000.00	02/05/2026	3,361,552.73	5,456.86	3,309,491.25	3.643%	91282CPT2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	3,000,000.00	02/17/2026	2,994,023.44	48,439.23	2,939,190.00	3.571%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	3,000,000.00	03/05/2026	3,001,992.19	48,439.23	2,939,190.00	3.476%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	4,500,000.00	03/06/2026	4,491,562.50	72,658.84	4,408,785.00	3.567%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	2,500,000.00	03/09/2026	2,496,093.75	40,366.02	2,449,325.00	3.556%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	03/15/2029	1,725,000.00	03/17/2026	1,713,881.84	22,804.69	1,689,085.50	3.729%	91282CQE4
UNITED STATES TREASURY	US	BNY MELLON	03/15/2029	3,350,000.00	03/17/2026	3,326,445.31	44,287.36	3,280,253.00	3.750%	91282CQE4
UNITED STATES TREASURY	US	BNY MELLON	03/15/2029	1,250,000.00	03/25/2026	1,235,888.67	16,525.14	1,223,975.00	3.906%	91282CQE4
UNITED STATES TREASURY	US	BNY MELLON	03/15/2029	3,400,000.00	04/07/2026	3,369,320.31	44,948.37	3,329,212.00	3.827%	91282CQE4
UNITED STATES TREASURY	US	BNY MELLON	03/15/2029	2,500,000.00	04/09/2026	2,474,609.38	33,050.27	2,447,950.00	3.869%	91282CQE4
UNITED STATES TREASURY	US	BNY MELLON	04/15/2029	2,500,000.00	04/15/2026	2,504,882.81	28,586.07	2,469,725.00	3.805%	91282CQJ3
UNITED STATES TREASURY	US	BNY MELLON	04/15/2029	1,500,000.00	05/06/2026	1,498,183.59	17,151.64	1,481,835.00	3.918%	91282CQJ3
UNITED STATES TREASURY	US	BNY MELLON	04/15/2029	3,000,000.00	05/07/2026	2,989,687.50	34,303.28	2,963,670.00	3.999%	91282CQJ3
UNITED STATES TREASURY	US	BNY MELLON	05/15/2029	600,000.00	05/22/2026	594,843.75	4,927.99	592,500.00	4.184%	91282CQR5
UNITED STATES TREASURY	US	BNY MELLON	05/15/2029	3,350,000.00	06/04/2026	3,326,445.31	27,514.61	3,308,125.00	4.130%	91282CQR5
UNITED STATES TREASURY	US	BNY MELLON	05/15/2029	3,000,000.00	06/08/2026	2,978,671.88	24,639.95	2,962,500.00	4.134%	91282CQR5
UNITED STATES TREASURY	US	BNY MELLON	05/15/2029	4,000,000.00	06/04/2026	3,972,968.75	32,853.26	3,950,000.00	4.120%	91282CQR5
UNITED STATES TREASURY	US	BNY MELLON	05/15/2029	2,750,000.00	06/12/2026	2,726,259.77	22,586.62	2,715,625.00	4.191%	91282CQR5
UNITED STATES TREASURY	US	BNY MELLON	06/15/2029	1,075,000.00	07/07/2026	1,073,362.30	5,694.42	1,068,281.25	4.180%	91282CQV6
UBS AG (STAMFORD BRANCH)	YK	BNY MELLON	01/10/2028	745,000.00	01/10/2025	745,000.00	2,113.81	746,050.45	4.540%	90261AAD4
COOPERATIEVE RABOBANK UA (NEW YORK BRANCH)	YK	BNY MELLON	01/21/2028	1,525,000.00	01/21/2025	1,525,000.00	2,068.49	1,534,058.50	4.883%	21688ABK7
COMMONWEALTH BANK OF AUSTRALIA (NEW YORK BRANC	YK	BNY MELLON	03/14/2028	915,000.00	03/14/2025	915,000.00	15,401.25	913,819.65	4.423%	20271RAV2
COOPERATIEVE RABOBANK UA (NEW YORK BRANCH)	YK	BNY MELLON	06/09/2028	1,575,000.00	06/09/2026	1,575,000.00	9,191.43	1,570,259.25	4.041%	21688ABX9
NATIONAL AUSTRALIA BANK LTD (NEW YORK BRANCH)	YK	BNY MELLON	06/13/2028	945,000.00	06/13/2025	945,000.00	5,428.08	941,645.25	4.308%	632525CJ8
NATIONAL AUSTRALIA BANK LTD (NEW YORK BRANCH)	YK	BNY MELLON	12/13/2028	430,000.00	01/13/2026	429,845.20	2,207.33	422,973.80	3.864%	632525CQ2
COMMONWEALTH BANK OF AUSTRALIA (NEW YORK BRANC	YK	BNY MELLON	03/27/2029	745,000.00	03/27/2026	745,000.00	11,175.41	740,559.80	4.355%	20271RAX8
UBS AG (STAMFORD BRANCH)	YK	BNY MELLON	11/29/2030	425,000.00	05/29/2026	425,000.00	3,424.04	421,744.50	4.679%	90261AAJ1
FIDELITY GOVERNMENT		BNY MELLON		3,829.35		3,829.35	-	3,829.35	3.300%	
LOCAL AGENCY INVESTMENT FUND		LAIF	DAILY	71,688,998.38		71,688,998.38	-	71,688,998.38	3.850%	*AT 07/31/26*
CAMP		CAMP	DAILY	286,731,226.19		286,731,226.19	-	286,731,226.19	3.780%	*AT 07/31/26*
				718,554,053.92		717,209,137.09	3,424,209.74	715,170,431.51		

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SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
INVESTMENT SUMMARY
JULY 31, 2026

INVESTMENT DESCRIPTION	SECURITY TYPE	INSTITUTION	MATURITY DATE	PAR VALUE	SETTLEMENT DATE	PURCHASE PRICE	ACCRUED INTEREST	MARKET VALUE	BOOK YIELD RATE	CUSIP
GENERAL FUND										
GMCAR 263 A2A	ABS	BNY MELLON	05/16/2029	155,000.00	07/15/2026	154,995.97	294.84	154,940.22	4.504%	362546AB9
COMET 2026-1 A	ABS	BNY MELLON	07/16/2029	530,000.00	07/16/2026	529,876.83	989.33	528,963.64	4.530%	14041NGJ4
HALST 26C A3	ABS	BNY MELLON	07/16/2029	235,000.00	07/29/2026	234,956.62	61.10	234,893.19	4.687%	44935LAD3
PILOT 2026-1 A3	ABS	BNY MELLON	08/20/2029	125,000.00	06/12/2026	124,996.85	168.44	124,807.69	4.717%	73328FAD0
HART 26B A3	ABS	BNY MELLON	02/18/2031	265,000.00	06/17/2026	264,968.01	531.18	264,851.68	4.557%	44935KAD5
FORDO 26B A3	ABS	BNY MELLON	02/18/2031	260,000.00	06/23/2026	259,990.90	507.29	258,963.64	4.432%	34536DAD5
TAOT 2026-C A3	ABS	BNY MELLON	03/17/2031	220,000.00	07/21/2026	219,968.01	275.61	219,532.98	4.803%	89231DAD7
BNP PARIBAS NEW YORK BRANCH	CD	BNY MELLON	08/06/2026	850,000.00	08/07/2025	850,000.00	35,516.07	850,047.55	4.190%	05593DJE4
CRÉDIT INDUSTRIEL ET COMMERCIAL	CD	BNY MELLON	10/08/2026	1,000,000.00	10/09/2025	1,000,000.00	32,477.78	1,000,012.09	3.950%	22536WM94
GOLDMAN SACHS BANK USA	CD	BNY MELLON	10/27/2026	600,000.00	10/28/2025	600,000.00	17,728.00	599,865.65	3.840%	40054PJQ9
TORONTO-DOMINION BANK - NEW YORK BRANCH	CD	BNY MELLON	12/09/2026	550,000.00	12/11/2025	550,000.00	13,882.92	549,665.04	3.900%	89115DJH0
CREDIT AGRICOLE CORPORATE AND INVESTMENT BANK, N	CD	BNY MELLON	02/01/2027	350,000.00	02/05/2024	350,000.00	8,191.17	350,990.70	4.760%	22536DWD6
UBS AG STAMFORD BRANCH	CD	BNY MELLON	03/02/2027	450,000.00	03/03/2026	450,000.00	7,191.38	448,948.35	3.810%	90275DVV9
BARCLAYS BANK PLC (NEW YORK BRANCH)	CD	BNY MELLON	04/01/2027	650,000.00	04/02/2026	650,000.00	9,132.14	649,694.04	4.180%	06745GJH5
UBS AG (STAMFORD BRANCH)	CN	BNY MELLON	08/07/2026	200,000.00	08/29/2025	194,634.00	1,208.33	199,940.00	4.193%	22550L2G5
PACCAR FINANCIAL CORP	CN	BNY MELLON	08/10/2026	350,000.00	08/10/2023	349,825.00	8,395.63	350,070.00	5.068%	69371RS56
ROCHE HOLDINGS INC	CN	BNY MELLON	11/13/2026	230,000.00	11/13/2023	230,000.00	2,623.73	230,510.60	5.265%	771196CE0
MERCEDES-BENZ FINANCE NORTH AMERICA LLC	CN	BNY MELLON	11/13/2026	250,000.00	11/15/2024	249,795.00	2,600.00	250,372.50	4.844%	58769JBB2
NATIONAL RURAL UTILITIES COOPERATIVE FINANCE CORP	CN	BNY MELLON	02/05/2027	200,000.00	02/05/2024	199,940.00	4,693.33	200,434.00	4.811%	63743HFM9
TEXAS INSTRUMENTS INC	CN	BNY MELLON	02/08/2027	220,000.00	02/08/2024	219,859.20	4,863.22	220,356.40	4.623%	882508CE2
CHEVRON USA INC	CN	BNY MELLON	02/26/2027	255,000.00	02/26/2025	255,000.00	4,836.32	255,459.00	4.405%	166756AZ9
MARS INC	CN	BNY MELLON	03/01/2027	90,000.00	03/12/2025	89,919.00	1,668.75	90,167.40	4.499%	571676AW5
AMERICAN HONDA FINANCE CORP	CN	BNY MELLON	03/12/2027	205,000.00	03/13/2024	204,887.25	3,878.49	205,580.15	4.920%	02665WFD8
STATE STREET CORP	CN	BNY MELLON	03/18/2027	120,000.00	03/18/2024	120,000.00	2,213.56	120,460.80	4.993%	857477CL5
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	05/14/2027	120,000.00	05/15/2025	119,946.00	1,155.00	120,214.80	4.524%	89236TNG6
CITIBANK NA	CN	BNY MELLON	05/29/2027	500,000.00	05/29/2025	500,000.00	3,940.44	501,395.00	4.576%	17325FBN7
USAA CAPITAL CORP	CN	BNY MELLON	06/01/2027	305,000.00	06/03/2024	304,118.55	2,668.75	307,202.10	5.356%	90327QD97
JOHN DEERE CAPITAL CORP	CN	BNY MELLON	06/11/2027	250,000.00	06/11/2024	249,690.00	1,701.39	251,292.50	4.945%	24422EXR5
AMAZON.COM INC	CN	BNY MELLON	08/22/2027	175,000.00	06/17/2024	166,498.50	2,434.69	172,959.50	4.814%	023135BC9
ACCENTURE CAPITAL INC	CN	BNY MELLON	10/04/2027	75,000.00	10/04/2024	74,903.25	950.63	74,557.50	3.946%	00440KAA1
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	10/08/2027	70,000.00	10/10/2024	69,972.70	955.79	69,960.10	4.364%	89236TMS1
PFIZER INC	CN	BNY MELLON	11/15/2027	120,000.00	11/21/2025	119,986.80	981.67	119,269.20	3.881%	717081FJ7
BP CAPITAL MARKETS AMERICA INC	CN	BNY MELLON	11/17/2027	255,000.00	05/17/2024	255,000.00	2,629.74	256,756.95	5.017%	10373QBY5
NATIONAL RURAL UTILITIES COOPERATIVE FINANCE CORP	CN	BNY MELLON	12/10/2027	315,000.00	12/10/2025	314,766.90	1,762.69	312,785.55	3.989%	63743HGB2
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	01/12/2028	145,000.00	01/12/2026	144,878.20	286.98	143,605.10	3.794%	89236TPF6
MASTERCARD INC	CN	BNY MELLON	01/15/2028	110,000.00	09/05/2024	109,939.50	200.44	109,579.80	4.119%	57636QBA1
ADOBE INC	CN	BNY MELLON	01/17/2028	225,000.00	01/17/2025	224,880.75	415.63	225,891.00	4.769%	00724PAH2
ELI LILLY AND CO	CN	BNY MELLON	02/12/2028	90,000.00	02/12/2025	89,942.40	1,922.38	90,180.00	4.573%	532457CU0
HERSHEY CO	CN	BNY MELLON	02/24/2028	105,000.00	02/24/2025	104,927.55	2,083.52	105,235.20	4.575%	427866BK3
ABBVIE INC	CN	BNY MELLON	03/03/2028	155,000.00	03/04/2026	154,947.30	2,389.26	153,279.50	3.793%	00287YED7
MERCEDES-BENZ FINANCE NORTH AMERICA LLC	CN	BNY MELLON	03/10/2028	525,000.00	03/10/2026	524,769.00	8,482.03	520,012.50	4.148%	58769JBJ5
AMAZON.COM INC	CN	BNY MELLON	03/13/2028	500,000.00	03/13/2026	499,695.00	7,379.17	495,135.00	3.882%	023135DB9
MASTERCARD INC	CN	BNY MELLON	03/15/2028	95,000.00	02/27/2025	94,927.80	1,632.94	95,079.80	4.576%	57636QBF0
SALESFORCE INC	CN	BNY MELLON	03/15/2028	450,000.00	03/13/2026	449,640.00	7,762.50	448,821.00	4.542%	79466LAQ7
BMW US CAPITAL LLC	CN	BNY MELLON	03/17/2028	300,000.00	03/19/2026	299,859.00	4,730.00	298,101.00	4.325%	05565EDF9
BMW US CAPITAL LLC	CN	BNY MELLON	03/21/2028	175,000.00	03/21/2025	174,912.50	3,001.74	175,098.00	4.768%	05565ECW3
CINTAS CORPORATION NO 2	CN	BNY MELLON	05/01/2028	150,000.00	05/02/2025	149,808.00	1,575.00	148,956.00	4.246%	17252MAR1
CUMMINS INC	CN	BNY MELLON	05/09/2028	25,000.00	05/09/2025	24,982.50	242.01	24,897.75	4.275%	231021AY2
WESTPAC BANKING CORPORATION (NEW YORK BRANCH)	CN	BNY MELLON	05/11/2028	250,000.00	05/14/2026	249,845.00	2,219.10	248,720.00	4.183%	9612EVAA7
SERVICENOW INC	CN	BNY MELLON	05/15/2028	35,000.00	05/15/2026	34,873.30	314.03	34,803.30	4.441%	81762PAF9
GILEAD SCIENCES, INC	CN	BNY MELLON	05/20/2028	230,000.00	05/20/2026	229,903.40	1,927.85	228,985.70	4.272%	375558CJ0
MERCK & CO INC	CN	BNY MELLON	05/22/2028	300,000.00	05/22/2026	299,880.00	2,472.50	299,457.00	4.321%	58933YCE3
MASTERCARD INC	CN	BNY MELLON	06/08/2028	445,000.00	06/08/2026	444,964.40	2,833.48	444,265.75	4.329%	57636QBJ2
NATIONAL SECURITIES CLEARING CORP	CN	BNY MELLON	06/09/2028	250,000.00	06/09/2026	249,842.50	1,570.83	249,122.50	4.383%	637639AR6
TARGET CORP	CN	BNY MELLON	06/15/2028	60,000.00	06/10/2025	59,999.40	333.50	59,856.60	4.350%	87612EBU9
ANALOG DEVICES INC	CN	BNY MELLON	06/15/2028	285,000.00	06/16/2025	284,692.20	1,547.71	283,660.50	4.289%	032654BD6
TRUIST BANK	CN	BNY MELLON	07/24/2028	250,000.00	07/24/2025	250,000.00	214.86	249,355.00	4.468%	89788JAF6
AMERICAN EXPRESS CO	CN	BNY MELLON	07/26/2028	30,000.00	07/26/2024	30,000.00	21.01	30,131.10	5.047%	025816DV8
PACCAR FINANCIAL CORP	CN	BNY MELLON	08/08/2028	350,000.00	08/08/2025	349,793.50	6,727.78	346,349.50	4.021%	69371RT97
CATERPILLAR FINANCIAL SERVICES CORP	CN	BNY MELLON	08/15/2028	250,000.00	08/15/2025	249,965.00	4,726.39	248,192.50	4.105%	14913UBB5
HOME DEPOT INC	CN	BNY MELLON	09/15/2028	65,000.00	09/15/2025	64,957.75	920.83	64,106.90	3.773%	437076DH2
NOVARTIS CAPITAL CORP	CN	BNY MELLON	11/05/2028	140,000.00	11/05/2025	139,969.20	1,304.33	138,257.00	3.908%	66989HAX6
MORGAN STANLEY PRIVATE BANK NA	CN	BNY MELLON	11/17/2028	250,000.00	11/19/2025	250,000.00	2,160.39	248,437.50	4.307%	61776NZU0
AMAZON.COM INC	CN	BNY MELLON	11/20/2028	120,000.00	11/20/2025	119,973.60	923.00	118,034.40	3.908%	023135CS3
JPMORGAN CHASE & CO	CN	BNY MELLON	01/24/2029	125,000.00	01/24/2025	125,000.00	119.46	125,417.50	4.744%	46647PEU6
PNC FINANCIAL SERVICES GROUP INC	CN	BNY MELLON	01/26/2029	160,000.00	01/26/2026	160,000.00	90.56	158,440.00	4.078%	693475CG8
PACCAR FINANCIAL CORP	CN	BNY MELLON	02/05/2029	125,000.00	02/05/2026	124,947.50	2,383.33	123,058.75	3.915%	69371RU38
ALPHABET INC	CN	BNY MELLON	02/15/2029	50,000.00	02/13/2026	49,818.50	863.33	48,942.00	3.829%	02079KBJ5
ABBOTT LABORATORIES	CN	BNY MELLON	03/09/2029	320,000.00	03/09/2026	319,593.60	4,670.22	312,480.00	3.745%	002824BR0
MERCK & CO INC	CN	BNY MELLON	03/15/2029	95,000.00	12/04/2025	94,859.40	1,381.72	93,364.10	3.900%	58933YBW4
AMERICAN EXPRESS CO	CN	BNY MELLON	04/25/2029	170,000.00	04/25/2025	170,000.00	2,144.72	170,045.90	4.734%	025816ED7
WELLS FARGO & CO	CN	BNY MELLON	05/20/2029	325,000.00	05/20/2026	325,000.00	2,933.73	323,758.50	4.581%	95000U4H3
CITIBANK NA	CN	BNY MELLON	06/18/2029	275,000.00	06/18/2026	275,000.00	1,495.86	273,946.75	4.457%	17325FBT4
TOYOTA MOTOR CREDIT CORP	CN	BNY MELLON	07/09/2029	300,000.00	07/09/2026	299,583.00	825.00	298,206.00	4.550%	89236TQD0
ACCENTURE CAPITAL INC	CN	BNY MELLON	07/10/2029	115,000.00	07/10/2026	114,980.45	318.65	114,874.65	4.756%	00440KAF0
AMERICAN EXPRESS CO	CN	BNY MELLON	07/20/2029	175,000.00	07/25/2025	175,000.00	232.66	173,915.00	4.354%	025816EJ4
MORGAN STANLEY	CN	BNY MELLON	10/18/2029	180,000.00	10/22/2025	180,000.00	2,128.50	177,121.80	4.266%	61748UAK8
TRUIST BANK	CN	BNY MELLON	10/23/2029	310,000.00	10/23/2025	310,000.00	3,490.32	305,368.60	4.267%	89788JAH2
BANK OF NEW YORK MELLON CORP	CN	BNY MELLON	01/22/2030	70,000.00	01/22/2026	70,000.00	70.46	68,793.90	4.102%	06406RCG0
WELLS FARGO & CO	CN	BNY MELLON	01/23/2030	95,000.00	01/23/2026	95,000.00	88.29	93,414.45	4.245%	95000U4D2
GOLDMAN SACHS GROUP INC	CN	BNY MELLON	04/20/2030	135,000.00	04/20/2026	135,000.00	1,739.98	133,471.80	4.610%	38141GE83
JPMORGAN CHASE & CO	CN	BNY MELLON	04/23/2030	235,000.00	04/23/2026	235,000.00	2,819.90	231,688.85	4.428%	46647PFL5
BANK OF AMERICA CORP	CN	BNY MELLON	04/23/2030	160,000.00	04/23/2026	160,000.00	1,949.98	158,164.80	4.492%	06051GMY2
CHARLES SCHWAB CORP	CN	BNY MELLON	05/21/2030	70,000.00	05/21/2026	70,000.00	645.71	69,821.50	4.671%	808513CQ6
NATIXIS, NEW YORK BRANCH	CP	BNY MELLON	01/08/2027	750,000.00	04/17/2026	728,442.92	0.00	736,402.53	4.005%	63873KN86
MUFG BANK, LTD., NEW YORK BRANCH	CP	BNY MELLON	04/09/2027	1,500,000.00	07/15/2026	1,453,881.67	0.00	1,455,613.02	4.261%	62479MR96
FHMS K-1503 A2	FHLMC	BNY MELLON	03/25/2029	305,000.00	07/30/2026	295,373.44	837.23	295,445.75	4.585%	3137BXHB1
FHMS K-102 A2	FHLMC	BNY MELLON	10/25/2029	245,000.00	07/30/2026	230,194.73	517.97	230,131.44	4.593%	3137FQKC6
FNA 2026-M12 A	FNMA	BNY MELLON	12/25/2030	275,000.00	07/31/2026	254,503.91	504.40	275,000.00	4.015%	3136G6G36
UNITED STATES TREASURY	US	BNY MELLON	12/15/2026	500,000.00	01/09/2024	503,632.81	2,809.08	500,905.00	4.108%	91282CJP7
UNITED STATES TREASURY	US	BNY MELLON	12/15/2026	1,750,000.00	01/09/2024	1,758,955.08	9,831.80	1,753,167.50	4.187%	91282CJP7
UNITED STATES TREASURY	US	BNY MELLON	12/15/2026	100,000.00	01/05/2024	100,648.44	561.82	100,181.00	4.138%	91282CJP7
UNITED STATES TREASURY	US	BNY MELLON	02/15/2027	750,000.00	03/12/2024	746,630.86	14,272.27	750,367.50	4.289%	91282CKA8
UNITED STATES TREASURY	US	BNY MELLON	03/15/2027	625,000.00	04/11/2024	620,043.95	10,033.12	625,918.75	4.541%	91282CKE0
UNITED STATES TREASURY	US	BNY MELLON	04/15/2027	250,000.00	05/13/2024	248,906.25	3,319.67	250,717.50	4.661%	91282CKJ9

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SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
INVESTMENT SUMMARY
JULY 31, 2026

INVESTMENT DESCRIPTION	SECURITY TYPE	INSTITUTION	MATURITY DATE	PAR VALUE	SETTLEMENT DATE	PURCHASE PRICE	ACCRUED INTEREST	MARKET VALUE	BOOK YIELD RATE	CUSIP
UNITED STATES TREASURY	US	BNY MELLON	05/15/2027	300,000.00	06/11/2024	298,593.75	2,861.41	300,816.00	4.672%	91282CKR1
UNITED STATES TREASURY	US	BNY MELLON	05/15/2027	400,000.00	05/20/2024	399,125.00	3,815.22	401,088.00	4.579%	91282CKR1
UNITED STATES TREASURY	US	BNY MELLON	05/15/2027	650,000.00	06/07/2024	649,974.61	6,199.73	651,768.00	4.500%	91282CKR1
UNITED STATES TREASURY	US	BNY MELLON	05/15/2027	150,000.00	05/29/2024	148,962.89	1,430.71	150,408.00	4.752%	91282CKR1
UNITED STATES TREASURY	US	BNY MELLON	06/30/2027	750,000.00	07/09/2025	749,765.63	2,445.65	747,315.00	3.766%	91282CNL1
UNITED STATES TREASURY	US	BNY MELLON	07/15/2027	475,000.00	08/05/2024	480,455.08	960.00	475,926.25	3.957%	91282CKZ3
UNITED STATES TREASURY	US	BNY MELLON	08/15/2027	700,000.00	09/10/2024	702,816.41	12,109.81	696,822.00	3.603%	91282CLG4
UNITED STATES TREASURY	US	BNY MELLON	08/31/2027	400,000.00	09/13/2024	395,796.88	5,230.98	395,484.00	3.502%	91282CFH9
UNITED STATES TREASURY	US	BNY MELLON	09/15/2027	500,000.00	09/27/2024	498,750.00	6,373.98	495,510.00	3.464%	91282CLL3
UNITED STATES TREASURY	US	BNY MELLON	09/15/2027	300,000.00	10/04/2024	298,781.25	3,824.39	297,306.00	3.521%	91282CLL3
UNITED STATES TREASURY	US	BNY MELLON	09/15/2027	650,000.00	10/04/2024	646,394.53	8,286.18	644,163.00	3.574%	91282CLL3
UNITED STATES TREASURY	US	BNY MELLON	10/15/2027	775,000.00	11/04/2024	769,096.68	8,861.68	771,853.50	4.152%	91282CLQ2
UNITED STATES TREASURY	US	BNY MELLON	10/31/2027	200,000.00	11/18/2025	199,656.25	1,769.02	198,218.00	3.591%	91282CPE5
UNITED STATES TREASURY	US	BNY MELLON	11/15/2027	400,000.00	12/06/2024	399,515.63	3,497.28	399,408.00	4.168%	91282CLX7
UNITED STATES TREASURY	US	BNY MELLON	11/15/2027	500,000.00	12/10/2024	500,351.56	4,371.60	499,260.00	4.098%	91282CLX7
UNITED STATES TREASURY	US	BNY MELLON	11/15/2027	500,000.00	12/16/2024	500,019.53	4,371.60	499,260.00	4.122%	91282CLX7
UNITED STATES TREASURY	US	BNY MELLON	11/30/2027	800,000.00	12/08/2025	797,937.50	4,573.77	791,096.00	3.511%	91282CPL9
UNITED STATES TREASURY	US	BNY MELLON	12/31/2027	275,000.00	12/31/2025	274,183.59	807.07	271,691.75	3.530%	91282CPS4
UNITED STATES TREASURY	US	BNY MELLON	01/15/2028	75,000.00	01/15/2025	74,815.43	147.25	74,982.75	4.338%	91282CMF5
UNITED STATES TREASURY	US	BNY MELLON	01/15/2028	525,000.00	02/06/2025	524,774.41	1,030.74	524,879.25	4.265%	91282CMF5
UNITED STATES TREASURY	US	BNY MELLON	01/31/2028	550,000.00	01/09/2026	550,085.94	52.31	543,900.50	3.491%	91282CGH8
UNITED STATES TREASURY	US	BNY MELLON	02/15/2028	750,000.00	02/10/2025	718,974.61	9,514.85	733,125.00	4.226%	9128283W8
UNITED STATES TREASURY	US	BNY MELLON	02/29/2028	125,000.00	03/17/2026	124,199.22	1,765.46	123,320.00	3.717%	91282CQB0
UNITED STATES TREASURY	US	BNY MELLON	02/29/2028	475,000.00	03/17/2026	472,291.02	6,708.73	468,616.00	3.680%	91282CQB0
UNITED STATES TREASURY	US	BNY MELLON	03/15/2028	1,125,000.00	03/25/2025	1,120,517.58	16,466.12	1,118,013.75	4.018%	91282CMS7
UNITED STATES TREASURY	US	BNY MELLON	03/15/2028	500,000.00	04/10/2025	502,421.88	7,318.27	496,895.00	3.698%	91282CMS7
UNITED STATES TREASURY	US	BNY MELLON	03/31/2028	150,000.00	04/15/2026	150,210.94	1,953.38	149,034.00	3.799%	91282CQH7
UNITED STATES TREASURY	US	BNY MELLON	04/15/2028	500,000.00	05/05/2025	499,316.41	5,532.79	495,625.00	3.799%	91282CMW8
UNITED STATES TREASURY	US	BNY MELLON	04/30/2028	500,000.00	05/13/2026	498,554.69	4,738.45	495,565.00	3.904%	91282CQL8
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	250,000.00	05/15/2025	248,369.14	1,987.09	247,685.00	3.983%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	450,000.00	06/10/2025	448,453.13	3,576.77	445,833.00	3.874%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/15/2028	600,000.00	06/10/2025	595,968.75	4,769.02	594,444.00	3.995%	91282CND9
UNITED STATES TREASURY	US	BNY MELLON	05/31/2028	150,000.00	06/09/2026	149,619.14	1,016.39	149,238.00	4.135%	91282CQS3
UNITED STATES TREASURY	US	BNY MELLON	07/15/2028	400,000.00	08/06/2025	399,718.75	716.03	396,828.00	3.900%	91282CNM9
UNITED STATES TREASURY	US	BNY MELLON	08/15/2028	250,000.00	08/15/2025	249,287.11	4,180.77	246,710.00	3.726%	91282CNU1
UNITED STATES TREASURY	US	BNY MELLON	08/15/2028	525,000.00	09/05/2025	525,020.51	8,779.61	518,091.00	3.623%	91282CNU1
UNITED STATES TREASURY	US	BNY MELLON	09/15/2028	600,000.00	09/19/2025	597,093.75	7,648.78	588,678.00	3.547%	91282CNY3
UNITED STATES TREASURY	US	BNY MELLON	09/15/2028	250,000.00	09/29/2025	248,037.11	3,186.99	245,282.50	3.657%	91282CNY3
UNITED STATES TREASURY	US	BNY MELLON	10/15/2028	1,000,000.00	11/12/2025	997,304.69	10,327.87	982,770.00	3.597%	91282CPC9
UNITED STATES TREASURY	US	BNY MELLON	11/15/2028	525,000.00	10/08/2025	517,658.20	3,477.41	511,381.50	3.605%	9128285M8
UNITED STATES TREASURY	US	BNY MELLON	11/15/2028	275,000.00	12/04/2025	274,699.22	2,040.08	270,047.25	3.539%	91282CPK1
UNITED STATES TREASURY	US	BNY MELLON	12/15/2028	100,000.00	12/15/2025	99,578.13	449.45	98,137.00	3.650%	91282CPP0
UNITED STATES TREASURY	US	BNY MELLON	12/15/2028	425,000.00	01/13/2026	424,485.35	1,910.18	417,082.25	3.543%	91282CPP0
UNITED STATES TREASURY	US	BNY MELLON	12/15/2028	125,000.00	01/15/2026	124,667.97	561.82	122,671.25	3.596%	91282CPP0
UNITED STATES TREASURY	US	BNY MELLON	01/15/2029	400,000.00	02/05/2026	398,406.25	646.74	392,236.00	3.643%	91282CPT2
UNITED STATES TREASURY	US	BNY MELLON	01/15/2029	500,000.00	02/10/2026	498,964.84	808.42	490,295.00	3.574%	91282CPT2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	500,000.00	02/17/2026	499,003.91	8,073.20	489,865.00	3.571%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	375,000.00	03/05/2026	375,249.02	6,054.90	367,398.75	3.476%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	500,000.00	03/06/2026	499,062.50	8,073.20	489,865.00	3.567%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	02/15/2029	400,000.00	03/09/2026	399,375.00	6,458.56	391,892.00	3.556%	91282CQA2
UNITED STATES TREASURY	US	BNY MELLON	03/15/2029	250,000.00	04/07/2026	247,744.14	3,305.03	244,795.00	3.827%	91282CQE4
UNITED STATES TREASURY	US	BNY MELLON	03/15/2029	300,000.00	04/09/2026	296,953.13	3,966.03	293,754.00	3.869%	91282CQE4
UNITED STATES TREASURY	US	BNY MELLON	04/15/2029	450,000.00	05/06/2026	449,455.08	5,145.49	444,550.50	3.918%	91282CQJ3
UNITED STATES TREASURY	US	BNY MELLON	04/15/2029	350,000.00	05/07/2026	348,796.88	4,002.05	345,761.50	3.999%	91282CQJ3
UNITED STATES TREASURY	US	BNY MELLON	05/15/2029	525,000.00	06/04/2026	521,308.59	4,311.99	518,437.50	4.130%	91282CQR5
UNITED STATES TREASURY	US	BNY MELLON	05/15/2029	250,000.00	06/08/2026	248,222.66	2,053.33	246,875.00	4.134%	91282CQR5
UNITED STATES TREASURY	US	BNY MELLON	06/15/2029	200,000.00	07/07/2026	199,695.31	1,059.43	198,750.00	4.180%	91282CQV6
COOPERATIEVE RABOBANK UA (NEW YORK BRANCH)	YK	BNY MELLON	05/27/2027	250,000.00	05/27/2025	250,000.00	1,943.11	250,137.50	4.372%	21688ABM3
COMMONWEALTH BANK OF AUSTRALIA (NEW YORK BRANC	YK	BNY MELLON	03/14/2028	250,000.00	03/14/2025	250,000.00	4,207.99	249,677.50	4.423%	20271RAV2
COOPERATIEVE RABOBANK UA (NEW YORK BRANCH)	YK	BNY MELLON	06/09/2028	300,000.00	06/09/2026	300,000.00	1,750.75	299,097.00	4.041%	21688ABX9
NATIONAL AUSTRALIA BANK LTD (NEW YORK BRANCH)	YK	BNY MELLON	06/13/2028	305,000.00	06/13/2025	305,000.00	1,751.92	303,917.25	4.308%	632525CJ8
AUSTRALIA AND NEW ZEALAND BANKING GROUP LTD (NEW	YK	BNY MELLON	06/18/2028	375,000.00	06/18/2025	375,000.00	1,953.81	374,088.75	4.362%	05253JB75
FIDELITY GOVERNMENT		BNY MELLON		19,383.15		19,383.15	-	19,383.15	3.300%	
LOCAL AGENCY INVESTMENT FUND		LAIF	DAILY	1,539,010.47		1,539,010.47	-	1,539,010.47	3.850%	*AT 07/31/26*
CAMP		CAMP	DAILY	63,308,909.88		63,308,909.88	-	63,308,909.88	3.780%	*AT 07/31/26*
				118,717,303.50		118,491,101.26	585,722.94	118,304,597.50		

ALL INVESTMENTS LISTED ON THIS MONTHLY INVESTMENT SUMMARY AND HELD BY SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT ARE IN COMPLIANCE WITH THE DISTRICT'S INVESTMENT POLICY.

THE DISTRICT CAN MEET ITS EXPENDITURE REQUIREMENTS FOR THE NEXT SIX MONTHS.

Cindy Saks
CFO / DEPUTY GENERAL MANAGER

	INVESTMENT TYPES
ABS	*ASSET-BACKED SECURITY*
AGENCY	*AGENCY BONDS*
FHLMC	FEDERAL HOME LOAN MORTGAGE CORPORATION
FNMA	FEDERAL NATIONAL MORTGAGE ASSOCIATION
CD	*CERTIFICATE OF DEPOSIT*
CN	*CORPORATE NOTE*
YK	*YANKEE*
CP	*COMMERCIAL PAPER*
MUNI	*MUNICIPAL BOND / NOTE*
US	*US TREASURY NOTES*

SAN BERNARDINO VALLEY | A REGIONAL WATER AGENCY SINCE 1954

DATE: August 18, 2026

TO: Board of Directors

FROM: Sayer Pinto, Principal Water Resources Analyst

SUBJECT: Water Delivery Report

The following amounts of water were delivered by San Bernardino Valley Municipal Water District:

(in acre-ft)

	JUL	Year to Date
State Water Project	3,213	14,167
Groundwater		
Baseline Feeder Wells	402	2,527
San Bernardino Avenue Well	0	0
Santa Ana River Diversions	1,373	9,295

San Bernardino Valley Municipal Water District

Delivery of Water For Calendar Year 2026 - Acre Feet

Measurement / Delivery Point	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
IMPORTED WATER SUPPLIES													
STATE WATER PROJECT DELIVERY CATEGORIES													
Yuba Accord Water (14-819)													
Article-21													
MWDSC Transfer													
CLAWA exchange water SWPAO #25-033													
Kern Delta Water Bank (11-015)													
Carryover	955	408											1,363
Table A		1,438	1,775	2,224	2,165	3,391							10,993
* **SWP into SBV Service Area (DWR Meters)**	**955**	**1,846**	**1,775**	**2,244**	**2,165**	**3,391**							**12,376**
RECHARGE DELIVERIES													
Sweetwater													
Sweetwater - Valley District													
Sweetwater - City of San Bernardino							76						76
Sweetwater - SNRC Settlement Agreement		101					76						176
Sweetwater - BLF Obligation to SBB													
Waterman													
Waterman - Valley District													
Waterman - BLF Obligation to SBB													
Waterman - SBB Non-GC Contribution (SBVWCD)													
Waterman - SNRC Settlement Agreement		572	16	15	15	1,429	777						2,824
Waterman - City of San Bernardino													
City Creek													
City Creek - SBB GC													
Santa Ana Low													
Santa Ana Low - BVMWC (purchase)													
Santa Ana Low - Redlands (purchase)													
Santa Ana Low - Valley District													
Santa Ana Low - SBB Non-GC Contribution (SBVWCD)													
Plunge Creek Spreading													
Plunge Creek - Northfork Delivery													
Mill Creek Spreading													
Mill Creek Spreading - Redlands													
Mill Creek Spreading - Valley District													
S.A.R.C.													
S.A.R.C. to Redlands Aqueduct - Recharge (purchased by Redlands)													
S.A.R.C. to Conservation District													
S.A.R.C. to Redlands													
Zanja East Weir to WCD - Valley District (USE WITH GREENSPOT OR TATE ONLY)													
Zanja East Weir to WCD - Valley District													
Wilson Basins													
Wilson Basins - YVWD							180						180
Wilson Basins - Valley District													
Oak Glen Basins - Valley District													
Oak Glen Basins - YVWD													
Sub-total Recharge		**673**	**16**	**15**	**15**	**1,429**	**1,109**						**3,255**

Delivery of Water For Calendar Year 2026 - Acre Feet

Measurement / Delivery Point	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
DIRECT DELIVERIES													
Lytle Creek													
West Valley Water District	219	252	467	461	526	305	342						2,572
Fontana													
Marygold Mutual				41	45	46	54						186
RHWC													
SB County - Glen Helen													
WMWD/MWDSC (MWDSC SWP Water)													
Lytle Creek - Fontana Water Company WTP	17												17
Lytle Creek - Fontana Water Company - CEMEX													
SALES/RETURNS/BANKING													
CLAWA Exchange (08-063)													
CLAWA Exchange (09-079)													
CLAWA Exchange (22-021)					12	26	47						85
EVWD Plant 134													
EVWD Plant 134 - BB Agreement (In-Lieu)													
EVWD Plant 134 - BVMWC purchase (for EVWD)													
EVWD Plant 134 - EVWD (purchase)			85	187	245	427	440						1,384
Northfork													
Northfork - EVWD (purchase)	355	324	231										910
Northfork - EVWD - BB Agreement													
Northfork - BVMWC purchase (for EVWD)													
Edwards Canal Pump - BVMWC In-Lieu													
Edwards Canal Pump - EVWD purchase for Farmer													
S.A.R.C.													
S.A.R.C. - Valley District													
S.A.R.C. to Redlands Aqueduct - Sandbox (purchased by Redlands)													
S.A.R.C. to Redlands Aqueduct - BB Agreement													
S.A.R.C. to Redlands Aqueduct - BVMWC purchase (for Redlands)													
S.A.R.C. to Redlands - Greenspot Forebay Replacement													
Arrowhead Springs													
Arrowhead Springs Turnout (Yuhaaviatam)				0									0
Bear Valley Highline Connector [Out of Service - Under Repair]													
Newport Ave.													
Newport Ave. - Greenspot Mutual													
Newport Ave. - BVMWC													
Newport Ave. - BVMWC (Greenspot Forebay Replacement)	1	2	6	6	7	7	12						40
Tres Lagos													
Tres Lagos - Greenspot Mutual													
Tres Lagos - BVMWC													
Tres Lagos - BVMWC (Greenspot Forebay Replacement)			5	21	22	21	24						92
Unger Lane to Zanja													
Unger Lane to Zanja - Crafton - BVMWC In-Lieu													
Unger Lane to Zanja - Crafton - BVMWC													
Boullioun Box													
Boullioun Box to Zanja													
Boullioun Box to Highline In-Lieu													
Boullioun Box to Highline - BVMWC													
Boullioun Box to Highline - BVMWC (Greenspot Forebay Replacement)	127	171	332	268	268	328	418						1,912
City of Redlands													
City of Redlands - Tate Treatment In-Lieu													
City of Redlands - Tate Treatment													
Yucaipa													
Yucaipa Regional Park		18	18	1	85	18	34						174
Yucaipa Valley Water District Treatment Plant	2	118	560	703	724	701	733						3,540
Western Heights													
Sub-total Direct Deliveries within SBV Service Area	**720**	**884**	**1,703**	**1,688**	**1,933**	**1,879**	**2,105**						**10,911**
SGPWA Service Area	1,327	1,881	2,155	1,143	1,625	2,424	1,745						12,300
Sub-total Direct Deliveries (SBV + SGPWA)	**2,047**	**2,765**	**3,858**	**2,831**	**3,558**	**4,303**	**3,850**						**23,211**

Delivery of Water For Calendar Year 2026 - Acre Feet

Measurement / Delivery Point	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
SUMMARY													
Recharge in SBV Service Area		**673**	**16**	**15**	**15**	**1,429**	**1,109**						**3,255**
Direct Deliveries in SBV Service Area	**720**	**884**	**1,703**	**1,688**	**1,933**	**1,879**	**2,105**						**10,911**
* **Deliveries to SGPWA Service Area**	**1,327**	**1,881**	**2,155**	**1,143**	**1,625**	**2,424**	**1,745**						**12,300**
* **Total Deliveries**	**2,047**	**3,438**	**3,874**	**2,846**	**3,572**	**5,732**	**4,958**						**26,467**
Total Deliveries within SBV Service Area	**720**	**1,557**	**1,719**	**1,703**	**1,947**	**3,308**	**3,213**						**14,167**
SAN BERNARDINO BASIN PUMPING													
Baseline Feeder													
Ninth Street North Replacement Well				235	282	192	159						869
Ninth Street South Replacement Well	223	197	263	226	270	237	242						1,658
Sub-total Baseline Feeder	223	197	263	462	552	429	402						2,527
San Bernardino Avenue Well No. 1 - Redlands													
San Bernardino Avenue Well No. 1 - Redlands - In Lieu													
San Bernardino Avenue Well No. 1 - Water Quality Testing		0.3			0.4								0.7
Redlands Pump Station													
De-watering Well # 1													
De-watering Well # 2													
Total San Bernardino Basin Pumping	**223**	**197**	**263**	**462**	**552**	**429**	**402**						**2,528**

* Pending final verification by San Bernardino Valley and Department of Water Resources staff.

DATE: August 18, 2026

TO: Board of Directors

FROM: Heather Dyer, Chief Executive Officer/General Manager

SUBJECT: CEO**/**General Manager's Report

In this report:

1. **Engagement Activities**
    - **Upcoming CEO/General Manager and Staff Speaking Engagements**
2. **Project Status Updates**

I. Engagement Activities

The Board of Directors, CEO/General Manager, and staff have participated in multiple community and industry events in recent weeks to highlight the ongoing priorities of the Strategic Plan. Activities included:

- July 21- Yucaipa Valley Water District Demand Management- Director Kielhold and staff presented a ceremonial check for their FY25/26 Demand Management project.
- July 28- San Bernardino Municipal Water Department Demand Management- Vice Chair Botello, Treasurer Longville, and staff presented a ceremonial check for their FY25/26 Demand Management project.
- August 11- Loma Linda Demand Management- President Harrison and CEO/General Manager presented a ceremonial check for their FY25/26 Demand Management project.

- August 14- BIA Southern California Water Conference- The Agency sponsored the annual Southern California Water Conference and CEO/General Manager moderated a panel discussion.

- **Upcoming CEO/General Manager and Staff Speaking Engagements**
  - Colton Demand Management Check Presentation (8/18)
  - West Valley Water District Roemer Water Filtration Facility Upgrade Ribbon Cutting (8/24)
  - California Water Plan Advisory Commission (8/25- 26)
  - City of Rialto Demand Management Check Presentation (8/25)
  - State Water Project Tour (9/16-18)

II. Project Status Updates

See attached.

Staff Recommendation

Receive and file.

Attachments

1. August Project Status Update
2. August 3-Month Look Ahead

Project Status Updates

Item	Status	Estimated Next Board Update or Action
Basin Optimization Plan	In progress. The Basin Optimization Plan Phase 1 concluded in early 2024. San Bernardino Valley and Western Water are working on the scope of work for Phase 2, including a historical State of the Basin document.	Update as needed
Bay-Delta Water Quality Control Plan Update/ Healthy Rivers & Landscapes Alternative	In progress. State Water Resources Control Board conducted hearings on the Healthy Rivers & Landscapes alternative April 2024. This alternative would result in adaptive management of the Bay Delta and provide more regulatory certainty for our State Water Project (SWP) supplies.	Update as needed
Bunker Hill Conjunctive Use Project	In progress. Staff is continuing coordination with local partners to develop alternatives and identify how best to move forward.	Update as needed
Cactus Basins Recharge	In progress. San Bernardino County and San Bernardino Valley have contracted with the Facilitator authorizing continued efforts. The Facilitator gathered preliminary input and hosted four Technical Advisory Group (TAG) meetings. Serving as technical representatives, staff reviewed information provided by the three	Update as needed

Item	Status	Estimated Next Board Update or Action
	remediation projects regarding how the remedies are monitored for performance (the County's and two Superfund remediation projects) Staff reviewed groundwater model results that will be used to develop the Adaptive Management Plan (AMP) and are beginning to develop the monitoring program for the AMP.	
Climate Adaptation and Resilience Plan (CARP)	In progress. Staff are working on implementation of the CARP that was approved by the Board in October 2024.	Update as needed
Cost of Service and Rate Design Study	In progress. Work on the study is underway.	Update as needed
County Line Road Basin Recharge Project	In progress. Staff are working with San Gorgonio Pass Water Agency (SGPWA) on this project. The Board of Directors awarded the SWP turnout construction contract at the April 21 meeting. Construction is anticipated to be completed by December 2026.	Ribbon Cutting event, Fall 2026
CSUSB Regional Water Fellowship	In progress. The Institute for Watershed Resiliency has welcomed seven 2026-27 Fellows sponsored by San Bernardino Valley. Introductions of the new students will be brought to a Board Meeting in the fall.	Introduction event, Fall 2026
Cybersecurity Improvements	In progress. Staff continue to identify and implement policies, procedures,	Update as needed

Item	Status	Estimated Next Board Update or Action
	and systems to enhance the Agency's digital security.	
Delta Conveyance Project	In progress. The Water Rights Hearing is continuing through 2027, including an extensive public input process.	Update as needed
Delta Conveyance Proposed Amendment to SWP Contract	In progress. Staff reviewed and provided comments on the 2024 draft agreement. Once a consensus on language is reached a final agreement will be brought to the Board for consideration.	2027
Demand Management Program	In progress. FY 2025/26 program pivoted to be more grant style rather than automatic incentives, making the program more flexible to local water retailers' unique needs. The Agency is continuing to make ceremonial presentations of the awards to water retailers through August.	Update as needed
Devil Basin Preliminary Design	In progress. Devil Basin Preliminary Design involves improving the existing Sweetwater SWP turnout and basins, constructing a new SWP turnout in Devil Canyon, and improving the basins for enhanced recharge capabilities. The Agency is reviewing design proposals to advance the project for Board consideration. Simultaneously staff is working with SBCoFCD and City of San Bernardino on recharge agreements. The Agency is preparing for a	Fall 2026

Item	Status	Estimated Next Board Update or Action
	percolation test and has initiated cultural and biological surveys.	
East Branch Extension and Central Feeder Intertie Project	In progress. Staff have finalized the design and coordination with DWR staff. The construction contract for this project was approved by the Board in December. Construction will be underway once long lead-time materials arrive. This project will be completed in 2027.	Update as needed
Emergency Response Program	In progress. Staff continue to identify and implement measures that enhance the Agency's operational resiliency during emergencies, including enhancing the communications system which allows for additional security cameras, more reliable internet, and increased SCADA data security. The Agency is working on updating the Emergency Response Plan.	Update as needed
Engagement Activities	In progress. The Board of Directors, Heather Dyer, and staff have participated in multiple community and industry events in recent months to highlight the ongoing priorities of the Strategic Plan. Communications resources supporting projects and programs include informative social media posts, project materials, industry conference and community presentations.	Update as needed

Item	Status	Estimated Next Board Update or Action
Foothill Pipeline Crossing (City Creek Crossing) Project	In progress. The Feasibility Study was completed in 2023, and design phase is 95% complete. Staff are currently working with the SBCoFCD and Metropolitan Water District of Southern California (Metropolitan) to discuss alternative solutions for this project.	Update as needed
Foothill Pump Station and Inland Feeder Intertie Project	In progress. San Bernardino Valley has authorized the joint operational agreement with Metropolitan, with implementation pending their Board approval. Staff have been assisting on permit preparations and a mitigation strategy for potential impacts to SBKR. Construction is anticipated to begin following contract award by Metropolitan.	Update as needed
Forecast-Informed Reservoir Operations (FIRO) at Seven Oaks Dam Preliminary Viability Assessment, UC San Diego & USACOE	In progress. The final Preliminary Viability Assessment report was published in July 2026. Meetings of the FIRO Steering Committee are progressing, and staff are participating in multiple Work Teams. Staff are working with Western Water on an updated Cost Share Agreement for next two years.	August 2026
Golden Mussel	In progress. Staff are actively monitoring SWP pipelines for presence of golden mussel. The Agency is coordinating with DWR, and San Gabriel Municipal Water District regarding the on-going pilot study for	Update as needed

Item	Status	Estimated Next Board Update or Action
	treatment location along the Azusa Pipeline at the Devil Basin Afterbay. The Agency continues to dose the East Branch with EarthTec. As of August, no mussels have been detected within the service area.	
Grant Management	In progress. Along with our Grant consultant (Kennedy Jenks), staff are managing 10 active grants: US Bureau of Reclamation (5 grants); Wildlife Conservation Board (1 grant); SARCCUP/SAWPA/ Department of Water Resources (1 grant); US Fish and Wildlife Service/California Department of Fish and Wildlife (2 grants); and Department of Water Resources (1 grant).	Update as needed
Headwaters Resiliency Partnership (HRP)	In progress. Staff continue to coordinate with partners on program development, monitoring plans, and implementation of joint projects. The team is advancing strategic plans: forest-wide nonnative plant management with the USFS, Bear Creek watershed treatment, and a communications plan. Staff are working with the Funding Work Group to evaluate Proposition 4 and other funding opportunities.	Update as needed
Legislative Activities	In progress. The Agency continues to monitor State and Federal legislative activities including budget discussions,	Monthly updates

Item	Status	Estimated Next Board Update or Action
	leadership appointments, and grant funding opportunities.	
Louis Rubidoux Parkland & Pecan Grove (LRPPG) Master Plan Development	In progress. Work is ongoing on the development of a master plan. Planning and coordination are also underway to identify sustainable water sources to support irrigation and habitat restoration.	Update as needed
Mitigation Credit Agreement Application	In progress. Following Board direction, staff are working with the California Department of Fish and Wildlife to prepare the Mitigation Credit Agreement application. The Agency recently received "Due Diligence" approval for long-term land management. This is a formal process stipulated in government code for all entities proposing to manage mitigation lands. Staff continue working to receive approval to hold mitigation endowment funds.	September/ October 2026
Native Fish Habitat Enhancement Structures in the Santa Ana River	In progress. The project was initiated in 2022 and successfully achieved performance criteria for 2023 - 2025. 2026 field work will continue through September. It is important to note that this is an effective, yet labor-intensive process.	October/ November 2026
Native Fish Survey	In progress. Native Fish Surveys will take place August 17-September 4. This is a collaborative effort to track the distribution and abundance of native	Update as needed

Item	Status	Estimated Next Board Update or Action
	and non-native species in the Santa Ana River from Rialto Channel to Van Buren Bridge. This on-going annual effort supports water capture and water recycling project permit requirements. Findings from this effort are used to evaluate effectiveness of mitigation measures and are used by regulatory agencies to set permit requirements.	
On-going Species Surveys	On-going. Least Bell's vireo surveys along the Santa Ana River were completed for the SNRC and HCP permit requirements by the in-house certified biologist. Staff developed methodology and implementation based on the importance of strict statistical analysis to ensure robust methodology and data analysis. Additionally, the Agency has submitted a plan to establish an in-house brown-headed cowbird management program to reduce impacts on native bird species.	Update as needed
Per- and Polyfluoroalkyl Substances (PFAS)	Staff are participating in SAWPA's watershed-wide PFAS study and engaging in other regional PFAS related activities.	Update as needed
Rialto Basin Perchlorate Task Force	In progress. The Task Force meets quarterly. Discussions within the group have been very collaborative.	Update as needed
Riverside Habitat, Parks, and Water Project	In progress. Staff are working with Riverside Public Utilities on design and	Update as needed

Item	Status	Estimated Next Board Update or Action
	CEQA. Work to revise the Draft Environmental Impact Report (DEIR) and associated technical assessments is ongoing. Staff are working with RPU to develop their 1211 Wastewater Change Petition to submit to the State Water Resources Control Board.	
Salt and Nutrient Management Plan for the Upper Santa Ana River Watershed Groundwater Basins	In progress. The Salt and Nutrient Management Plan (SNMP) workgroup met to discuss an update on the Regional Salt Mitigation Feasibility Study. Staff are coordinating with Regional Board staff to address comments on the assumptions that will be used for groundwater modeling. Staff are executing cost share agreements with the parties for the SNMP Phase 3A consultant expenses as approved by the Board.	Update as needed
Santa Ana River Enhanced Recharge Phase 1-B Habitat Restoration	Ongoing. Staff coordinated with SBCoFCD for delivery of excess sediment caused by the Line Fire from local stormwater channels that is now being used for habitat restoration groundcover. As required by the project permits, habitat restoration and preservation will be on-going through at least 2029.	Update as needed
Sites Reservoir Project	In progress. The Water Rights hearing began in 2024 and may be completed in late 2026. This complex process has included multiple extensions for public	November/ December 2026

Item	Status	Estimated Next Board Update or Action
	comment, prior to consideration for a proposed order to the full State Water Board.	
Sites Reservoir Project Governance Approach and Accompanying Agreements	In progress. Work to develop and reach a consensus on the following agreements continues: Benefits & Obligations Contract, Updated Joint Powers Agreement, Updated Bylaws, Agreement with DWR (statement of charges). The Benefits & Obligations Contract has been updated to strengthen the governance of the project in parallel with a legislative solution sponsored by Metropolitan. The Agency may hold a joint workshop with SGPWA to present final draft of agreements.	November/ December 2026
Southern California Edison East End Hydroelectric Facilities	In progress. The Agency entered into an Asset Purchase Agreement with SCE to acquire 7 hydroelectric plants. The transfer has been approved by the CPUC and FERC. All parties have executed the JPA agreement. The first board meeting of the Santa Ana Watershed Hydro Authority is scheduled for August 2026. Recruitment for initial staffing is underway. Staff are preparing draft permit applications and engineering design for critical repair projects for next steps after FERC approval.	September 2026

Item	Status	Estimated Next Board Update or Action
State Water Project Tour	The Agency is preparing for the Fall 2026 tour of State Water Project facilities in the Delta.	Update as needed
Sterling Natural Resource Center (SNRC) Mitigation Measures Assistance	In progress. Staff are managing implementation and reporting on behalf of East Valley Water District (EVWD) for all their mitigation obligations for the SNRC Project. All permit requirement expectations have been met or exceeded. Staff are beginning preparations for the 2026 Reimbursement Agreement between San Bernardino Valley and EVWD. As part of this partnership, San Bernardino Valley incurs over $50,000 in staffing expenses that are being provided in kind, as well as coordinating over 1,000 volunteer hours annually for these mitigation measures.	October/ November 2026
Sunrise Ranch Property Master Plan	In progress. The project team is working on Phase 1 as approved by the Board of Directors in the 2026 Sunrise Ranch Master Plan. Biologic, cultural, and technical site surveys needed for preliminary analysis relating to the potential reservoir and mitigation credit acreage are underway. The Agency is also researching the creation of a non-profit organization.	Update as needed
Tributary Restoration Projects	In progress. Staff are managing habitat restoration efforts at four locations (Hidden Valley Creek, Lower Hole	Update as needed

Item	Status	Estimated Next Board Update or Action
	Creek, Anza Creek, and Old Ranch Creek). The Agency has now transitioned from construction to on-going managing and monitoring of the habitat in coordination with RivCo Parks Rangers.	
Upper Santa Ana River Habitat Conservation Plan	In progress. The entire document has been provided to USFWS for review by the Solicitor. Work on the NEPA will be underway following review by the USFWS. Additionally, all analysis and mitigation strategies prepared for the USFWS will also be used for review and consideration by state regulatory agencies.	October 2026, pending USFWS
Waterman Basins Mitigation	In progress. As part of the Waterman Basins mitigation, staff are managing habitat restoration at two locations, totaling 60 acres, at Hidden Valley Wildlife Area.	Update as needed
Weaver Basins Mitigation	In progress. Staff are managing San Bernardino kangaroo rat habitat restoration for construction of Weaver Basins. Approximately 22 acres are under active habitat management which includes habitat restoration with Agency Operations staff and heavy equipment. The Agency is working with the San Diego Zoo on species monitoring on site.	Update as needed

Item	Status	Estimated Next Board Update or Action
West Valley Water District:(WVWD) Lower Cactus Basin #2 Mitigation Assistance	In progress. Staff are managing WVWD's mitigation obligation for their Lower Cactus Basin #2 Long-term Maintenance Agreement with CDFW. 12 acres of habitat are under active management at Hidden Valley Wildlife Area over the next four years. Environmental and Finance staff have worked to prepare the 2026 Reimbursement Agreement for execution and annual invoice processing.	Update as needed
Western-San Bernardino Watermaster (1969 Judgement)	In progress. Data collection is underway for analysis and document development. Efforts will result in the report for submittal to the courts prior to the August 1 deadline.	Update as needed
Yucaipa Sustainable Groundwater Management Agency	In progress. Staff continue to participate in quarterly Groundwater Sustainability Agency meetings and engage with both water retailers and private well owners.	September/ October 2026

August 18, 2026

Agendas: 3 Month Look Ahead

Item	September	October	November	Pending/In Progress
AI, Data Centers, and Water & Energy Resilience (Board Request)	X			
Annual Review of the Investment Policy			X	
City Creek Crossing Update (Board Request)				X
Contract Procurement Review (Board Request)				X
District Cell Phone Update	X			
East Branch Extension Intertie Update	X			
Federal Legislative Update		X		
Headwater Resiliency Partnership (Board Request)				X
Procurement Policy Review (Board Request)				X
Quarterly Investment Portfolio Update from PFM Asset Management			X	
Reimbursement Policy for Board of Directors Travel / Agency Compensation (Board Request)				X
Reserve Policy Review (Board Request)				X
State Legislative Update	X		X	
State Water Project Connection for Arrowhead Springs Hotel Area Update	X			
Strategies and Outcomes for the Cost of Service Study (Board Request)				X

Summary Review of District’s Existing Agreements (Board Request)				X
Summary Review of District’s Existing Policies (Board Request)				X
Vehicle Replacement Policy			X	
Watershed Fellow Introductions	X			

DATE: August 18, 2026

TO: Board of Directors

SUBJECT: List of Announcements

A. August 19, 8:30 a.m. – Upper SAR WIFA by Teleconference (Cancelled)

B. August 20, 09:00 a.m. – Yucaipa Groundwater Sustainability Agency - Policy Workshop

C. August 24-27 – CSDA Annual Conference, Palm Desert, CA

D. September 1, 09:30 a.m. – SAWPA Commission Meeting by Teleconference or In-Person

E. September 1, 10:00 a.m. – SAWPA PA 24 Committee Meeting by Teleconference or In-Person

F. September 1, 2 p.m. – Regular Board Meeting by Teleconference or In-Person

G. September 3, 2 p.m. – Board of Directors' Special Meeting – Policy/Administration by Teleconference or In-Person

H. September 7 – Agency Closed in Observance of Federal Holiday

I. September 8, 10:00 a.m. – SAWPA PA 22 Committee Meeting by Teleconference or In-Person

J. September 8, 2 p.m. – Board of Directors' Special Meeting – Resources/ Engineering by Teleconference or In-Person

K. September 9, 1:30 p.m. – SBVW Conservation District Board Meeting

L. September 16, 09:30 a.m. – SAWPA Commission Meeting by Teleconference or In-Person
M. September 15, 2 p.m. – Regular Board Meeting by Teleconference or In-Person
N. September 16, 8:30 a.m. – Upper SAR WIFA by Teleconference (Cancelled)
O. September 16 - 18 – San Bernardino Valley State Water Project Tour (Sacramento)