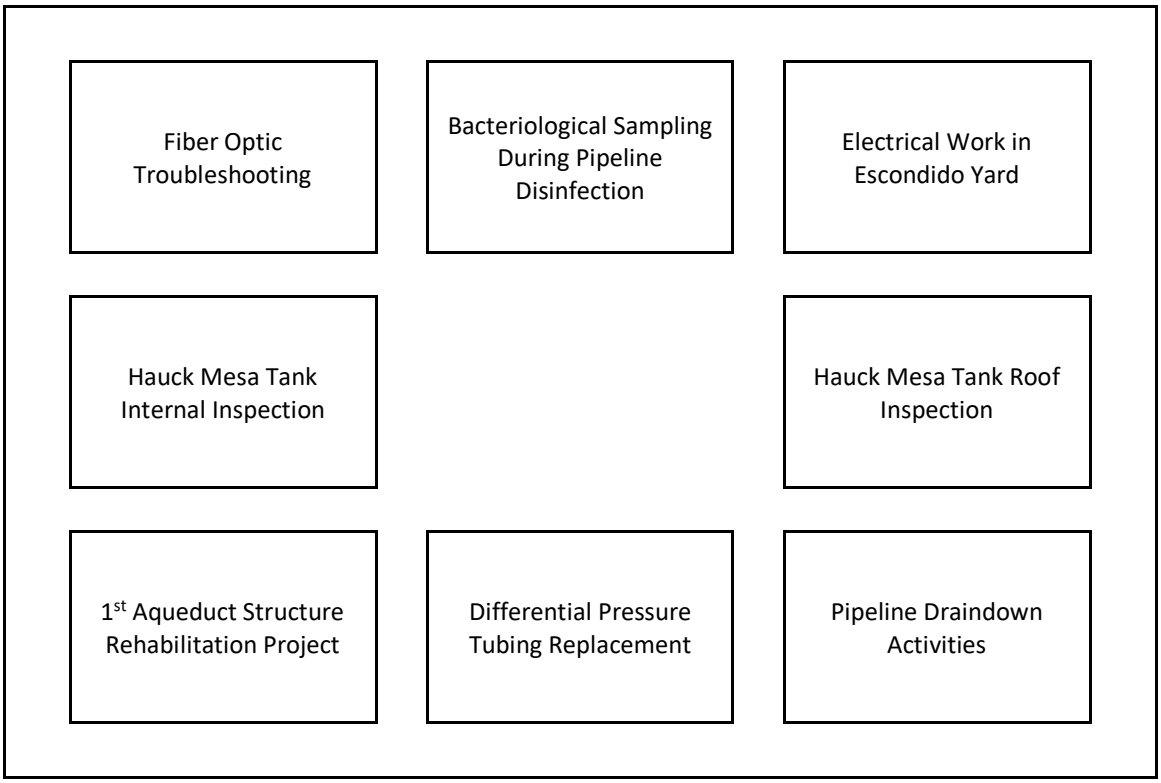
AQUEDUCT OPERATING PLAN

JULY 1, 2023 to JUNE 30, 2024

On the Cover


Fiber Optic Troubleshooting
Bacteriological Sampling During Pipeline Disinfection
Electrical Work in Escondido Yard
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Hauck Mesa Tank Roof Inspection
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Executive Summary

The annual Aqueduct Operating Plan (AOP) reflects on-going efforts to optimize the delivery, treatment, and storage of water in the San Diego region through coordination between member agency Operating Heads, Water Authority staff, and the Metropolitan Water District of Southern California (MWD). Staff has updated the AOP for fiscal year 2024 to reflect anticipated operational opportunities and constraints, and to evaluate our performance for fiscal year 2023.

The AOP includes the Water Authority's anticipated pump station operating schedules and water treatment plant outages. The AOP was developed based on information received from member agencies, historical delivery/production data, capacity constraints within the Water Authority's aqueduct system, and scheduled shutdowns. Highlights for fiscal year 2024 include:

- System supply and capacity will be sufficient for meeting the region's anticipated treated and untreated water requests.
- Treated water supply delivery is anticipated to peak at approximately 40 percent of treated aqueduct capacity for the fiscal year.
- Treated deliveries will be supplied by approximately 23 percent Twin Oaks Valley Water Treatment Plant, 34 percent Carlsbad Desalination Plant, and 29 percent QSA treated, 14 percent MWD.
- Untreated water supply delivery is anticipated to peak at approximately 60 percent of untreated aqueduct capacity for the fiscal year.
- Untreated deliveries will be supplied by approximately 94 percent QSA, 6 percent Storage, and 0 percent MWD.
- There will be two treated water shutdowns and one treated water outage*.
- There will be two untreated water shutdowns.

**Shutdowns affect large portions of the system and affect deliveries to a significant number of metered connections; outages are more localized and have considerably smaller impact on aqueduct deliveries.*

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Water Supply/Conveyance

Based on the projected demands for both treated and untreated deliveries, it is expected that demand during the fiscal year 2024 will not exceed available supply or system capacity on either system. These projections indicate the total treated water deliveries will peak at approximately 40 percent of the 650 cfs treated water pipeline capacity (Figure 1). This includes treated water deliveries from MWD's Skinner Treatment Plant, Twin Oaks Valley Water Treatment Plant, and the Carlsbad Desalination Plant.

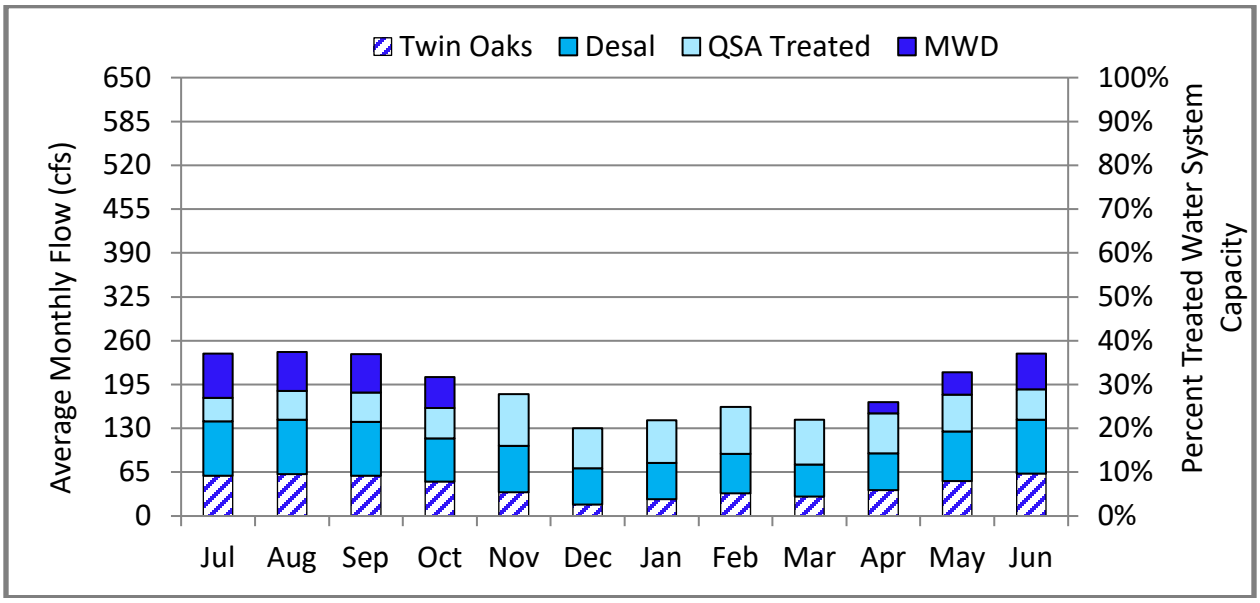

Figure 1 - FY 2024 Projected Treated Water Supply Utilization

Based on untreated projections for the year, deliveries will peak at approximately 60 percent of the 780 cfs untreated pipeline capacity (Figure 2). Untreated water deliveries will fall into two categories this year – QSA and Storage (Fill and Draft). MWD deliveries of untreated water are not expected to be needed to meet projected regional demands at this time with the projected demands.

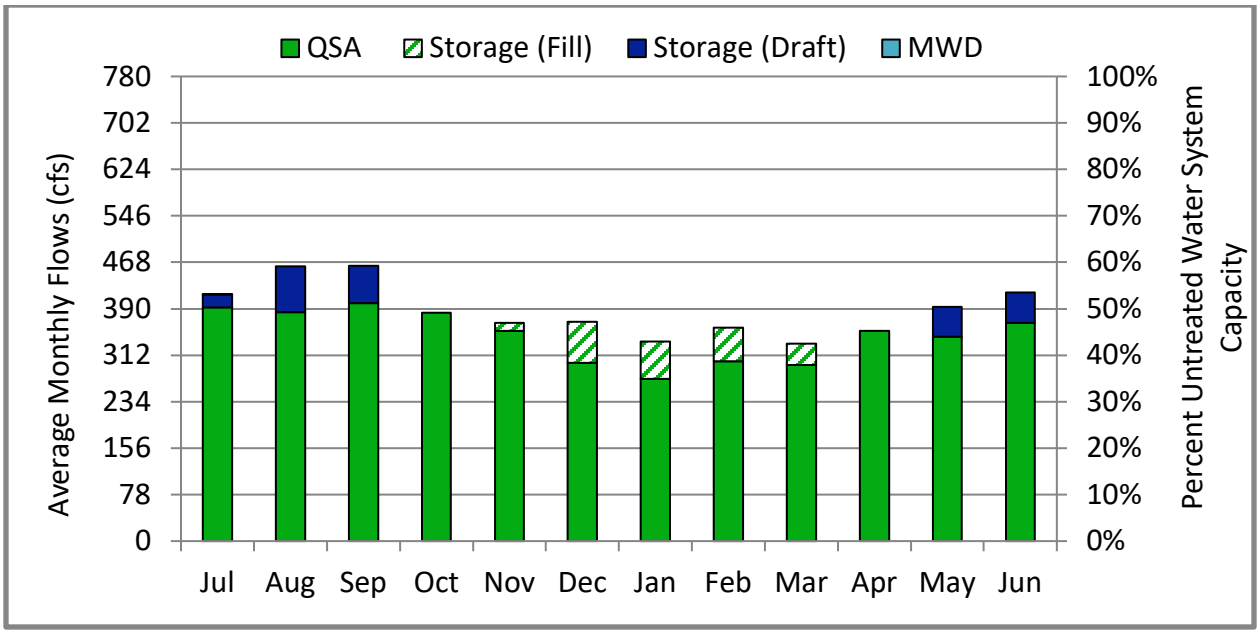

Figure 2 - FY 2024 Projected Untreated Water Supply Utilization

Fiscal year 2023 Water Authority demands for treated and untreated water have generally been lower than projected trends. Treated demands in December through March were slightly lower than projected. Lower untreated demands during the winter months resulted in the need to place QSA water into local storage for future use during the summer high demand months. For fiscal year 2023, both treated and untreated water volumes were well below pipeline capacities (see Figure 3 and 4).

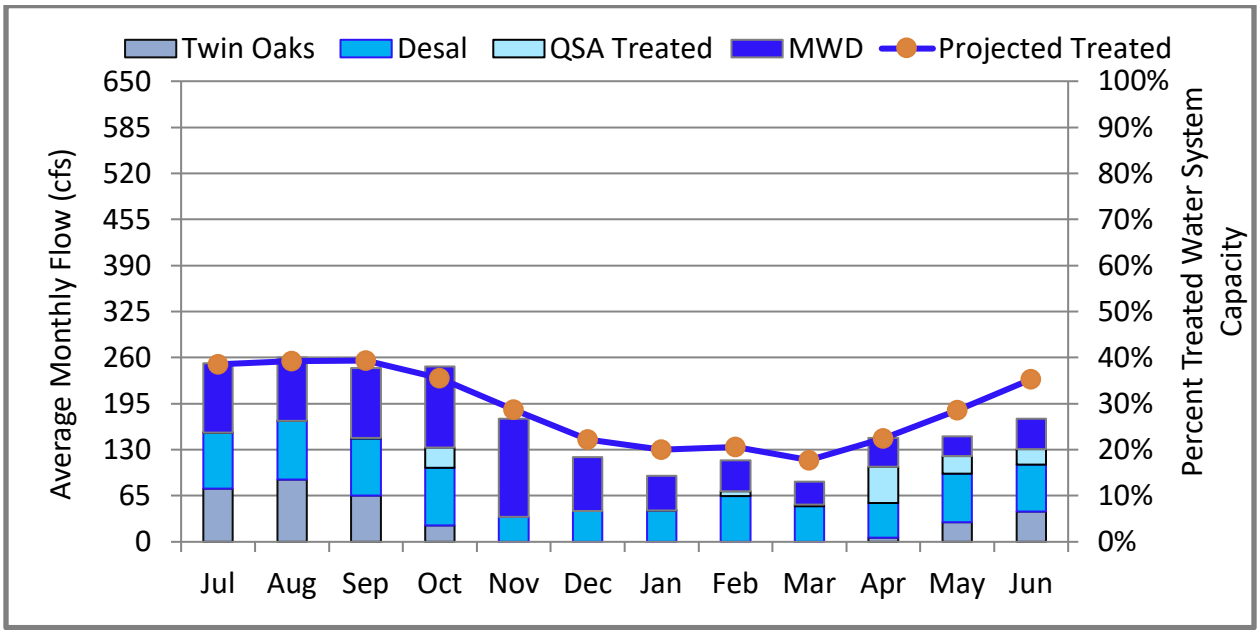

Figure 3 - FY 2023 AOP Treated Water Projection vs. Actual Deliveries

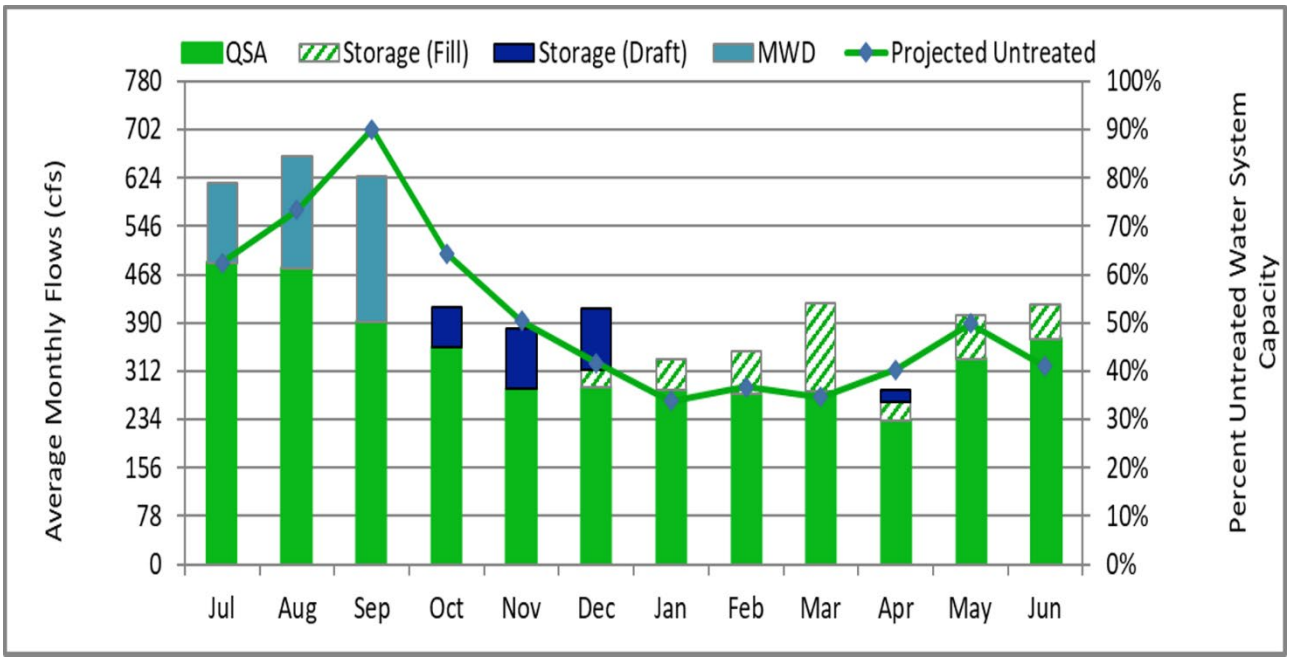

Figure 4 - FY 2023 AOP Untreated Water Projection vs. Actual Deliveries

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Untreated Water Distribution Priorities

Through a series of discussions with member agency staff, key untreated operating concerns were identified and used to develop untreated water delivery priorities. These priorities are intended to provide a framework for Water Authority operators to manage potential conflicts during untreated water high demand periods. The priorities agreed upon regarding untreated water distribution are shown in Figure 5.

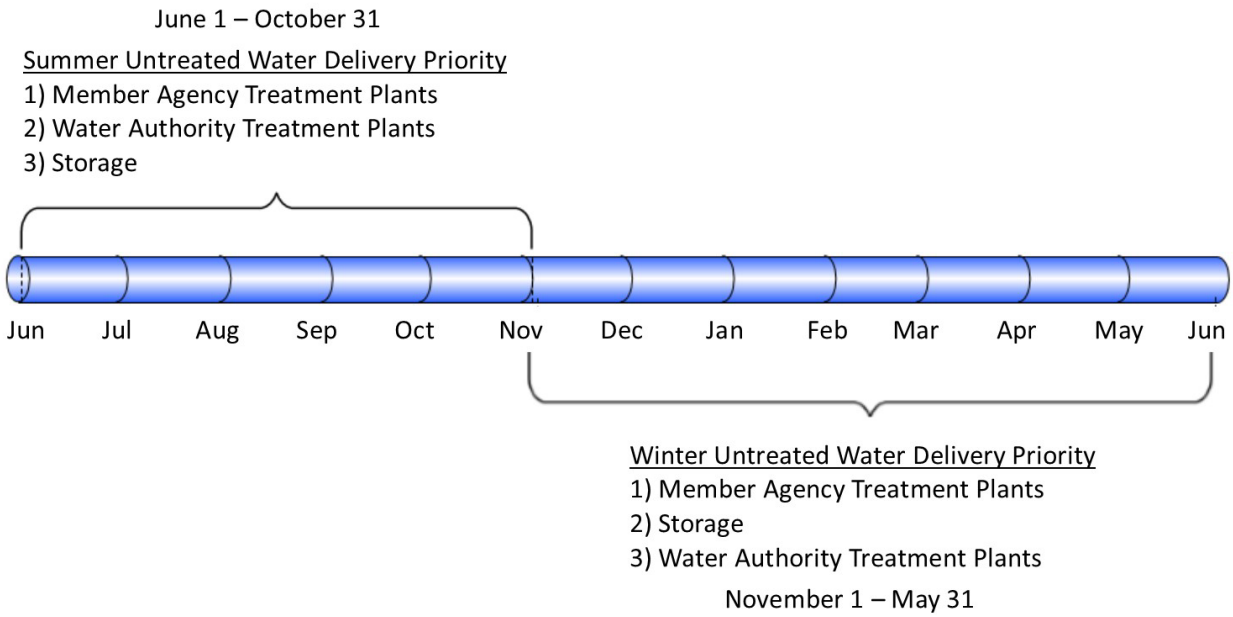

Figure 5 - Untreated Water Delivery Priorities

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Water Authority Aqueduct Shutdowns

The Water Authority conducts scheduled shutdowns of sections of pipeline and facilities for internal inspection, maintenance, and Capital Improvement Project connections on an annual basis. These shutdowns are coordinated with MWD, member agencies, and all Water Authority departments. The schedule includes three years of shutdowns to allow for the proper planning of maintenance and CIP activities for both the Water Authority and its member agencies. This three-year schedule is updated each January to facilitate the compilation of the annual AOP. At that time, the next fiscal year's aqueduct shutdown schedules are made available to member agencies for review and comment, prior to inclusion in the AOP.

Figure 6 – Pipeline 1 Tunnel Project Disinfection Team

For fiscal year 2024, there are two treated water shutdowns, two untreated water shutdowns, and one treated water outage scheduled between October 2023 and April 2024. While the O&M Department will be involved in additional maintenance activities that will maximize the benefits of the shutdowns planned for fiscal year 2024, the primary reasons for these shutdowns are to support activities related to either asset management or warranty inspections. The difference between shutdowns and outages are a matter of "scale", shutdowns affect large portions of the system and deliveries to a significant number of metered connections, while outages are more localized and have considerably smaller impact on aqueduct deliveries. A timeline and brief description of the shutdowns and outages are shown in Figure 8.

Figure 7 – Internal Pipe Inspection

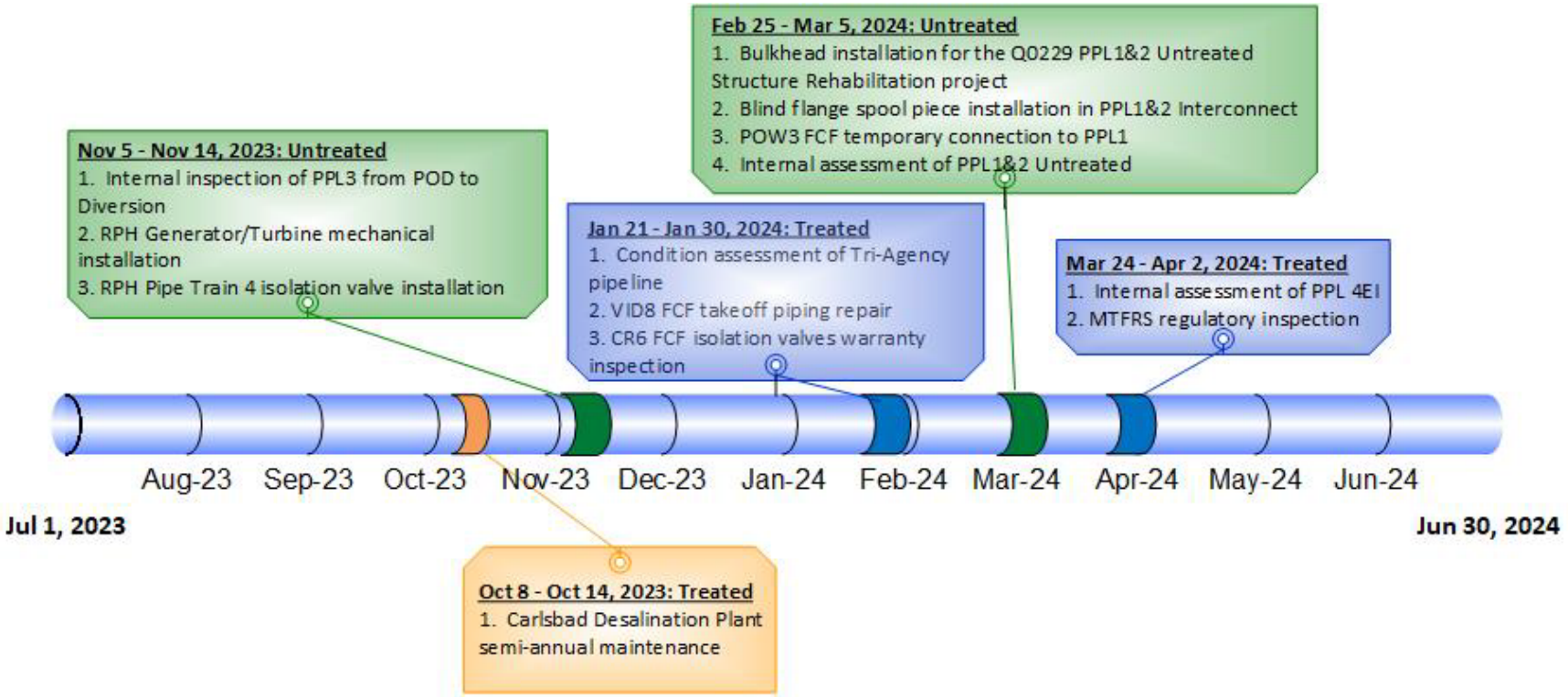

Figure 8 - Water Authority FY 2024 Pipeline Shutdowns and Outages

November 5 through November 14, 2023 - Untreated Water	
Description	10-day untreated shutdown of Pipeline 3 from MWD and Pipelines 5, 3/4/4A from Del Dios Valve Vault south
Shutdown Purpose	1. Internal inspection of Pipeline 3 from Point of Delivery to Diversion 2. Rancho Peñasquitos Hydro Facility final installation of generator/turbine mechanicals 3. Rancho Peñasquitos Hydro Facility installation of isolation valves on pipe train 4
Effects on MWD	All untreated deliveries on Pipeline 3 will be terminated during the shutdown reducing flow capacity by 280CFS. Pipeline 5 from point of delivery to Del Dios Valve Vault will remain in service with up to 500CFS available capacity.
Member Agency Connections Affected	The following connections will be affected by this shutdown – Pipeline 3 - OCS2; Pipeline 5 - SDSF4, SDSF5, *HLX6, *HLX7; Pipelines 3-4-4A-5 – SD5A, SD5B, SD5C, SD28, NCSB1, NCSB3, SD7, SD20, SD6A, SD6B

January 21 through January 30, 2024 - Treated Water	
Description	10-day treated shutdown of the Tri Agency Pipeline
Shutdown Purpose	1. Perform condition assessment of Tri Agency Pipeline from Pipeline 3/4 takeoff to terminus. 2. Repair takeoff piping for VID8 flow control facility 3. Warranty inspection of CR6 flow control facility isolation valves
Effects on MWD	Treated water capacity reduction of approximately 30CFS from MWD.
Member Agency Connections Affected	The following connections will be affected by this shutdown: Tri Agency Pipeline – VAL9(TAP), VID8, VID9, VID10, CR3, CR4, OCS4. Pipeline 3-4 – CR6(only 2 days).

February 25 through March 5, 2024 - Untreated Water	
Description	10-day untreated shutdown of Pipeline 1 and 2 from the XOVR Terminal Structure to SD 1 & 2 Terminal Structure (Raw Terminal Structure). *When the shutdown is complete the First Aqueduct untreated will have a reduced capacity of 90 cfs due to one section of pipeline being out of service until March 9th, 2025*
Shutdown Purpose	1. Installation of bulkheads for the Q0229 Pipeline 1 & 2* Structure Rehabilitation project to allow for reactivation of First Aqueduct untreated during rehabilitation work. **Pipeline 2 from Oat Hills Tunnel Downstream Bifurcation to Poway Tunnel Upstream/Downstream Bifurcation to Fire Hill Upstream Tunnel Bifurcation will remain out of service until March 9th, 2025.* 2. Install blind flange spool piece in Pipeline 1 & 2 interconnect facility. 3. Connect POW3 flow control facility to temporary connection on Pipeline 1 4. Perform internal assessment of untreated Pipeline 1 & 2 5. Replace isolation valve for Blowoff661 on Pipeline 1
Effects on MWD	Potential reduction of 90CFS in untreated flow demands from MWD due to terminating all untreated deliveries south of the XOVR Terminal Structure.
Member Agency Connections Affected	The following connections will be affected by this shutdown – Pipeline 1 & 2 – POW3, RAM1, POW1*, POW4, SD1, SD2, SD Weir, HLX1, HLX8. **POW1 will remain out of service for the duration of shutdown, POW4 will be available for up to 28CFS.*

March 24 through April 2, 2024 - Treated Water	
Description	10-day treated shutdown of Pipeline 4, 4BI, and 4BII from Black Mountain Vent to Lower Otay Terminal point.
Shutdown Purpose	1. Internal assessment of Pipeline 4EI 2. Inspect Mission Trails Flow Regulatory Structure
Effects on MWD	Minimal flow reduction on MWD based on shutdown location south of Miramar Hill.
Member Agency Connections Affected	The following connections will be affected by this shutdown: SDSF3, OLIV2, OLIV5, SD14, SD15, RAM3, PD4, SD18, SD21, HLX5, OTAY11, SD19, NCSB4, NCSB5, OTAY10, OTAY12, OTAY13, Miramar Pump Station, SD27, SD-MCAS

October 8 through 14, 2023 – Treated Water	
Description	7-day outage of Carlsbad Desalination Plant for semi-annual maintenance.
Outage	1. Carlsbad Desalination Plant semi-annual maintenance
Effects on MWD	Potential increase in MWD treated flow demands due to Desalination Plant being offline.
Member Agency Connections Affected	The following connection will be affected by this shutdown: Desalination Conveyance Pipeline – VAL9 will not be able to receive desalinated water during shutdown.

Member Agency Shutdowns

To optimize the delivery, treatment, and storage of water in San Diego County, a request was sent to the Member Agency Operating Heads to obtain schedules for member agency treatment plant expansions, CIP tie-ins, scheduled treatment plant maintenance, and shutdowns. The goal of this request is to facilitate the production of one schedule that the member agencies can use to schedule their work at times that will have the least impact on the region. Responses from member agencies confirmed upcoming maintenance activities including those shown in Figure 9. Several other maintenance projects were also identified, but they either lacked firm schedules or did not have a significant operational impact to the region. These types of projects, as well as Treatment Plant Shutdown coordination, will be carried out throughout the year as standing discussion items at the regularly scheduled Operating Head meetings.

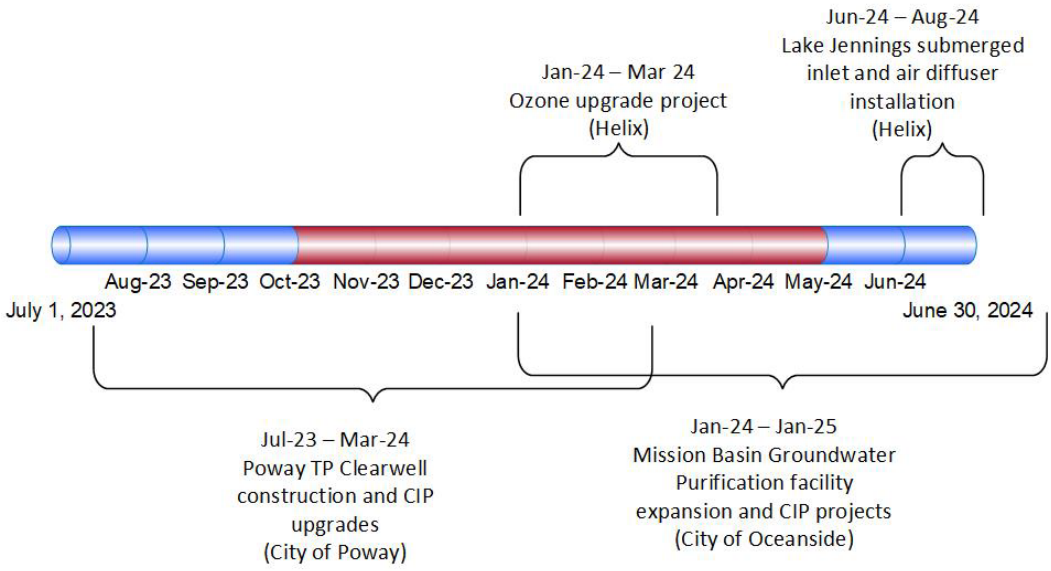

Figure 9 - Scheduled Member Agency Maintenance Coordination

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Water Authority Aqueduct Energy Production/Consumption

The Water Authority will continue operation of the Rancho Peñasquitos Pressure Control and Hydroelectric Facility (RPH) during fiscal year 2024. The Lake Hodges Pumped Storage Facility is non-operational due to water level restrictions by the Division of Safety of Dams, which are insufficient to operate the facility. Lake Hodges will remain offline but may be used as needed to maintain the water level restrictions. The Water Authority will operate five pump stations and Jacobs/OMI will operate the Twin Oaks Valley Water Treatment Plant in fiscal year 2024. Aqueduct operations also include over 100 small stations that consume energy. The following tables (Tables 1 and 2) list the larger facilities' anticipated operation schedules and costs:

				Generation		Consumption			
	Month of Operation		Turbine	Capacity	Power	Cost/Month	Cost/Year	Bill Credit Saving	Estimated Revenue
RPH	Nov-23	May-24	1	4.1 MW	14,500 MWh	$2,700	$32,400	$2,550,000	N/A
LHPS	Offline		2	40 MW	SDGE	$18,800	$225,600	N/A	$0
						$21,500	**$258,000**		

Table 1 - Hydro Generation/Consumption

	Month of Operation		No. Pump	No. Pump Use	Operational Cost/Month	Operational Cost/Year
Pipeline 2A Pump Station	Jul-23	Jun-24	3	1 to 3	$1,035	$7,411
Olivenhain Pump Station	As Needed		3	1	$7,272	$87,268
Escondido Pump Station	As Needed		2	1 to 2	$1,634	$19,612
San Vicente Pump Station	As Needed		3	1 to 2	$11,014	$132,167
Miramar Pump Station	As Needed		3	1 to 3	$700	$8,400
Twin Oaks Water Treatment Plant	Jul-23	Jun-24	N/A	N/A	$134,333	$1,462,145
					$155,988	**$1,717,003**

Table 2 - Large Facility Operational Energy Costs

The total power cost to operate the Lake Hodges Pumped Storage Facility, Rancho Peñasquitos Pressure Control and Hydroelectric Facility, the five pump stations, and Twin Oaks Valley Water Treatment Plant is estimated to be $1,975,000 for fiscal year 2024. The fiscal year 2024 revenue and bill credits for all Water Authority hydroelectricity generation is estimated to be $2,550,000.

The Rancho Peñasquitos Hydroelectric generation is projected to be off-line until November 2023 due to the turbine generator replacement project during fiscal year 2024. The turbine replacement project was originally scheduled to be completed in April 2023, but is delayed due to equipment fabrication and delivery impacts. Energy generated by the Rancho Peñasquitos Hydroelectric Facility is monetized through SDG&E's Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) tariff as a bill credit at the Lewis Carlsbad Desalination Plant.

The Lake Hodges Pumped Storage Facility was unable to be operated for pumped storage during fiscal year 2023 due to the water level restrictions placed on Lake Hodges reservoir, therefore, it did not meet its revenue goal of $1,150,000 for fiscal year 2023. (See Figure 10)

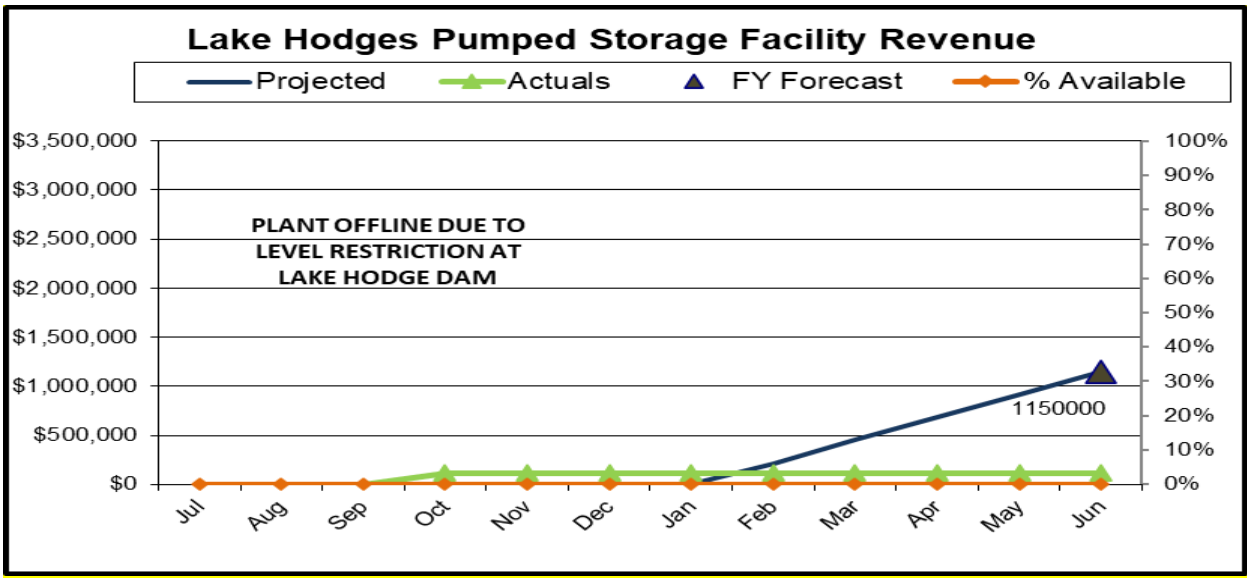

Figure 10 - Annual Revenue Generated at Lake Hodges Pump Storage Facility FY2023

Bill credit savings from the Rancho Peñasquitos Pressure Control and Hydroelectric Facility for fiscal year 2023 was projected to be $1,600,000. As a result of the turbine generator replacement project delays, only $929,428 in credits was realized during fiscal year 2023. (See Figure 11)

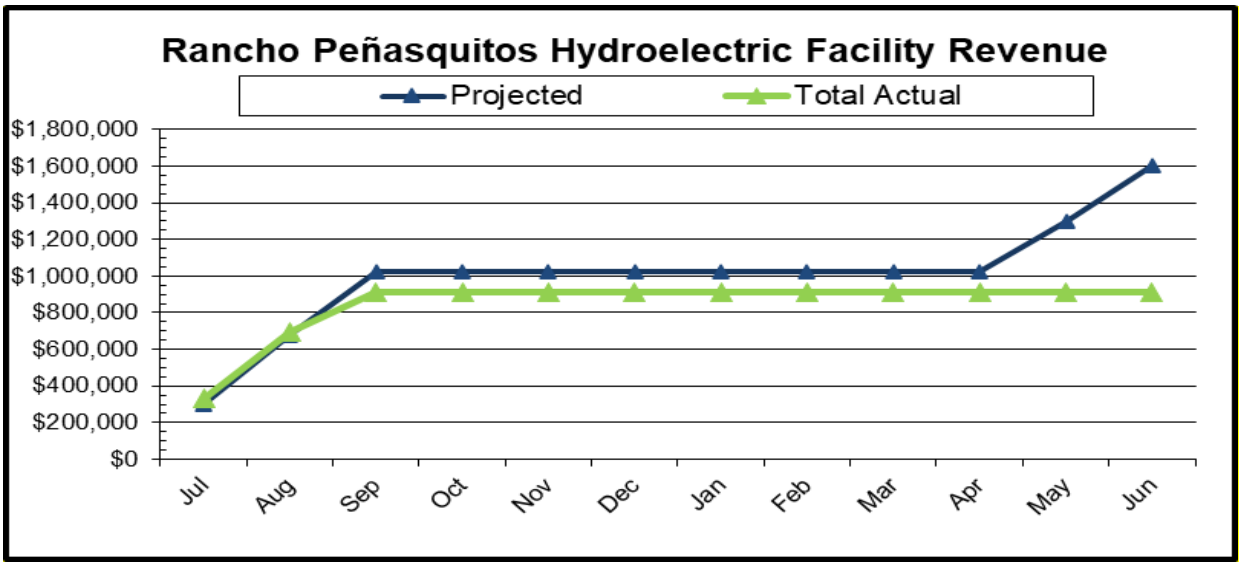

Figure 11 – Annual Revenue Generated at RPHEF for FY2023

Solar Generation

In October of 2010, a Solar Power and Services Agreement was signed between the Water Authority and Borrego Solar Systems Incorporated (Borrego) which allowed Borrego to install solar systems at the Kearny Mesa Headquarters, Escondido Operations Center, and the Twin Oaks Valley Water Treatment Plant. The Water Authority purchases the power generated at these sites at rates lower than the projected utility rate, resulting in electricity cost savings. The systems are owned and maintained by Borrego so there are no expenses to the Water Authority other than staff time required to monitor the agreements. The Twin Oaks Water Treatment Plant solar system is currently offline due to a faulty transformer. The system will remain offline until repairs are completed. The following table (Table 3) lists the solar facilities' anticipated generation and estimated savings for fiscal year 2024:

	Month of Operation		Generation (kWh)	Estimated Savings
Escondido Operations Center	Jul-23	Jun-24	232,000	$7,412
Twin Oaks Water Treatment Plant	Jul-23	Jun-24	OFFLINE	$59,225
Kearny Mesa Headquarters	Jul-23	Jun-24	684,000	$21,088
			Total:	**$87,725**

Table 3 – Solar Generation

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Reservoirs and Storage Opportunities

Member agency and Water Authority reservoirs serve multiple functions including surface water capture, seasonal shift water storage, carryover storage, and local sources of emergency water supplies. Member agency and Water Authority reservoirs function as system capacity buffers during peak demand periods and offer a level of security for short and long-term emergency situations. The size and location of each reservoir affects the extent to which it can perform the various functions, as does the individual agencies' operational plan (see Figure 11, Table 4, and Figure 12).

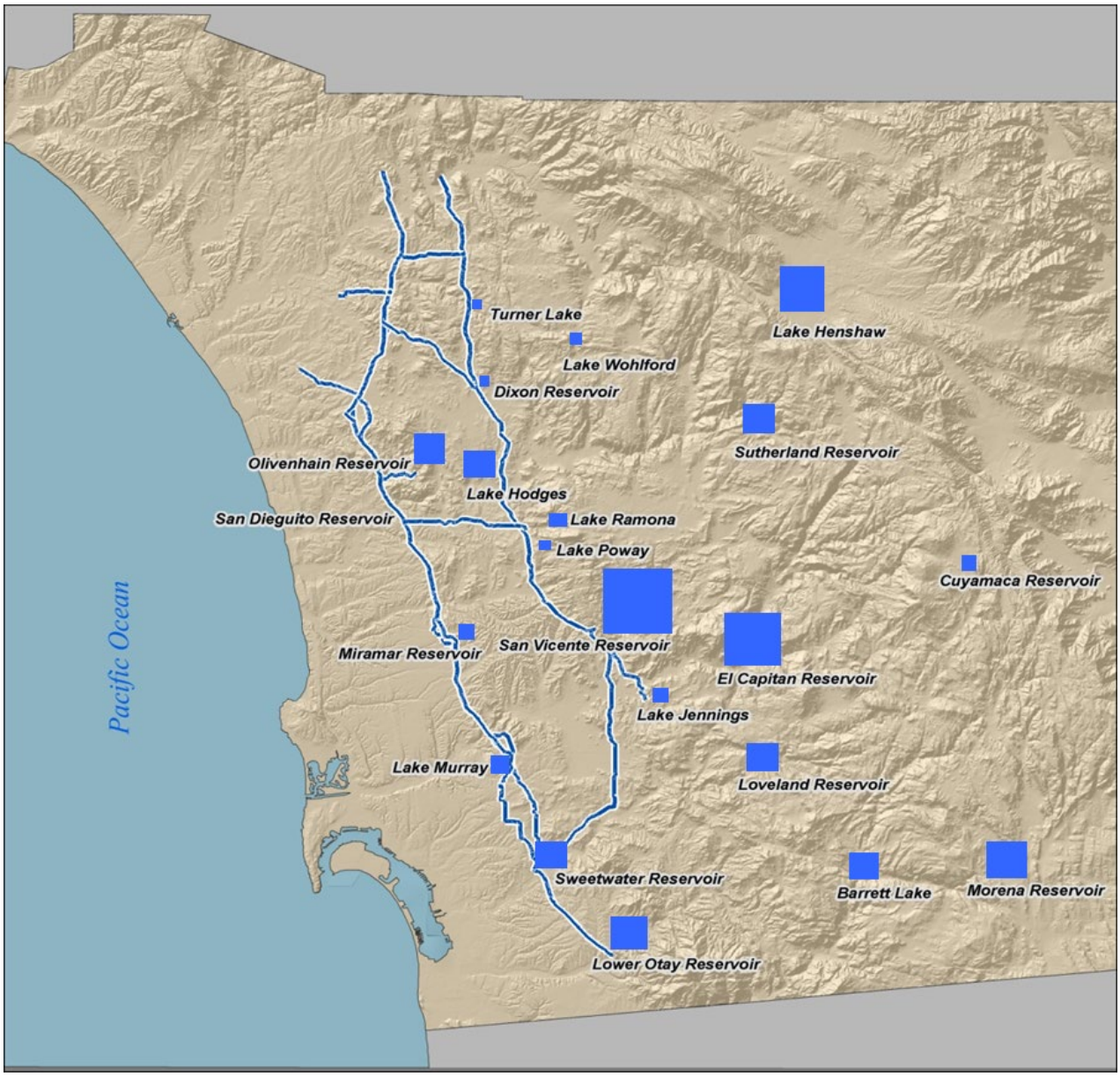

Figure 12 - Location and Relative Capacities of San Diego County Reservoirs

Table 4 - Storage/Capacity in Member Agency and Water Authority Reservoirs (AF)

Reservoir	[1]Total	Usable	Dead (unusable)	Storage as of **June 30, 2023**				
				Member Agency	Water Authority			Total
					Carryover	ESP	Operational	
Henshaw	51,774	51,768	6	**30,120**				**30,120**
Wohlford	6,506	6,156	350	**2,250**				**2,250**
Dixon	2,606	2,541	65	**2,447**				**2,447**
Sutherland	29,508	29,396	112	**21,141**				**21,141**
Hodges[2]	30,632	28,422	1,829	**5,019**				**5,019**
San Dieguito	883	717	166	**388**				**388**
San Vicente	249,358	244,130	5,228	**45,000**	**70,842**	**19,981**	**34,738**	**170,561**
El Capitan	112,807	109,992	2,815	**47,817**				**47,817**
Murray	4,684	4,292	392	**2,603**				**2,603**
Cuyamaca	8,195	8,195		**4,267**				**4,267**
Jennings	9,790	9,790		**8,749**				**8,749**
Loveland	25,400	25,225	175	**21,263**				**21,263**
Sweetwater	28,079	27,179	900	**19,187**				**19,187**
Morena	50,694	50,020	674	**12,514**				**12,514**
Barrett	34,806	34,207	599	**33,818**				**33,818**
Lower Otay	49,849	46,026	3,823	**45,027**				**45,027**
Miramar	6,682	5,774	908	**5,479**				**5,479**
Poway	3,330	2,560	770	**3,037**				**3,037**
Ramona	12,000	11,800	200	**1,677**				**1,677**
Olivenhain	24,774	24,731	43	**0**		**18,000**	**4,028**	**22,028**
Totals	**742,357**	**722,921**	**19,055**	**311,803**	**70,842**	**37,981**	**38,766**	**459,392**

Notes:

1. Capacity information: JMM Consulting Engineers, Inc. (1990), *San Diego County Water Authority Optimal Storage Study: Reservoir Summary Report*, unless updated by Member Agency staff.
2. Hodges Reservoir has a DSOD imposed level restriction of 280' which limits capacity to 5,995AF.

In addition to meeting local storage and operational demands, Olivenhain, San Vicente, and Hodges reservoirs play a significant role in the Water Authority's Emergency & Carryover Storage Program (E&CSP), in response to regional emergency and drought situations related to water supply availability.

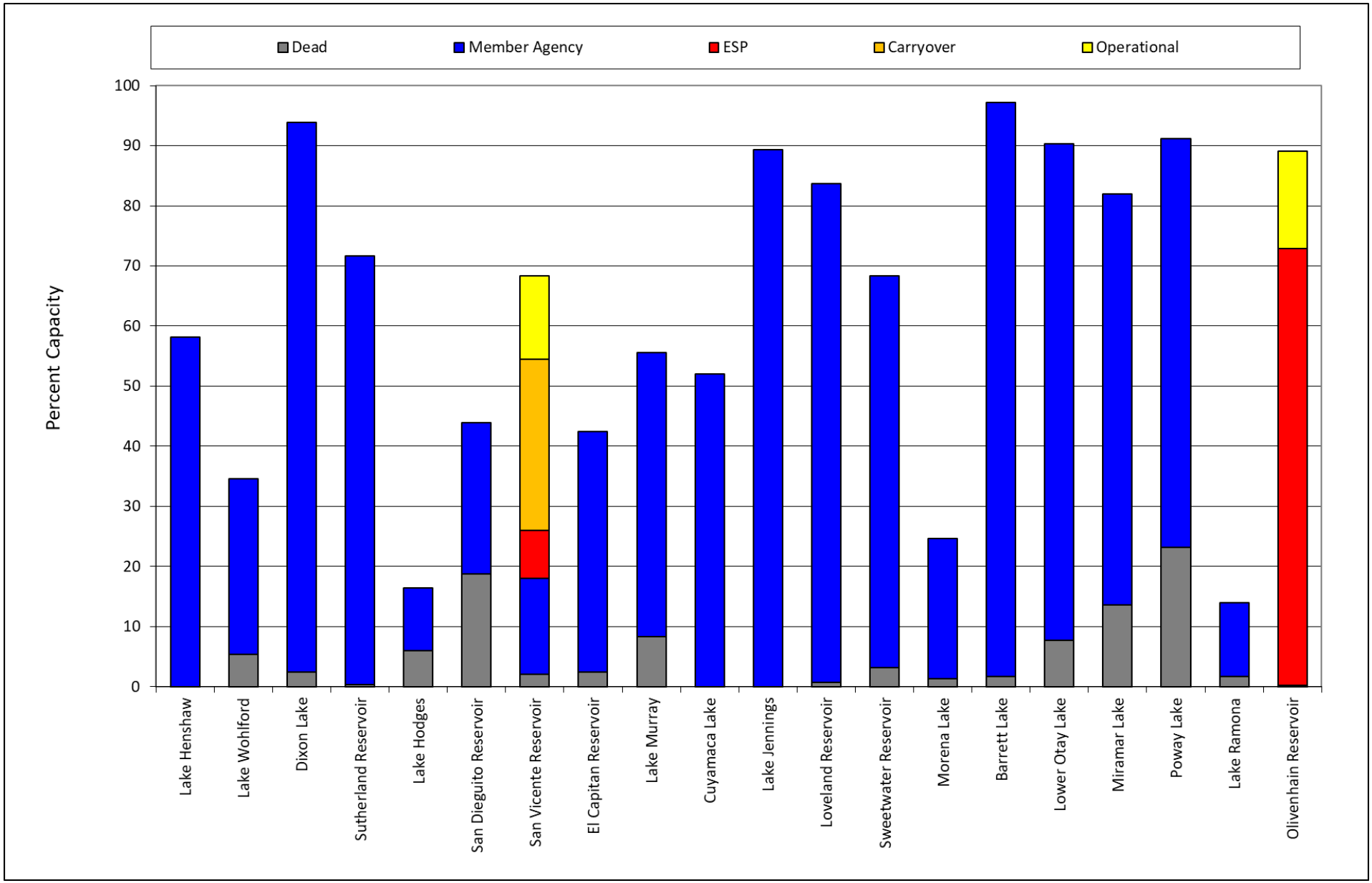

Figure 13- Regional Reservoir Levels (% of Capacity) as of June 30, 2023

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Asset Management and Major Maintenance Activities

In addition to ongoing corrective maintenance that is undertaken in response to specific needs or events, the O&M Department is also engaged in a rigorous program of predictive and preventative maintenance that ensures optimal condition/performance of Water Authority property, right-of-way, infrastructure, and assets throughout their life cycles. These maintenance activities include inspection, testing, calibration, brush management, operation, lubrication, and parts replacement/rehabilitation/upkeep. In addition to routine maintenance work, the O&M Department undertakes additional Asset Management projects and "major" projects that fall outside the scope of routine maintenance. Some of the activities undertaken during fiscal year 2023 included:

- Completed the 2022 annual Cathodic Protection survey and recommended improvement projects for future budget consideration.
- Commenced anode bed replacements on the Valley Center Pipeline using vertical auger drill.
- Performed a system-wide risk assessment of all pipelines and flow control facilities and compiled a recommendation for rehabilitation and replacement projects for the FY 2024/2025 CIP budget.
- Supported the development of multiple risk profiles for the proposed FY 2024/2025 CIP budget.
- Completed 6 improvement projects found in the 2022 annual Cathodic Protection survey.
- Completed 17 projects under the January 2023 Emergency Declaration, which were submitted to FEMA for reimbursement.
- Completed installation of ground cover over three exposed sections of Crossover Pipeline.
- Provided onsite construction and commissioning support to Engineering for Rancho Penasquitos Hydro (RPH) Turbine replacement.
- Completed replacement of Variable Frequency Drive Air Conditioning units at Valley Center Pump Station.
- Completed Warranty Inspection on Vallecitos 11 Vista Irrigation District 10 FCF
- Completed Internal Inspection of the Twin Oaks Flow Regulatory Basin
- Provided shutdown support for First Aqueduct Tunnel Rehabilitation and Pipeline 5 Reline Construction Projects.

The Asset Management and major maintenance activities planned by the O&M Department for fiscal year 2024 includes:

- Commence the comprehensive condition assessment of the untreated portion of the First Aqueduct, in alignment with the CIP rehabilitation project for pipeline structures.
- Undertake the comprehensive condition assessment of the Tri-Agencies Pipeline
- Continue replacement of depleted anode beds
- Enhance online water quality monitoring on treated water pipelines with the installation of three new analyzers – RAM3, OCS6, and CR4/OCS4 flow control facilities.

Figure 14 – January 2023 Storm – Rebuild Culvert Crossing

Figure 15 – Valley Center Pump Station VFD AC