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**Sent:** Friday, August 26, 2022 7:50 PM

**To:** Ekdahl, Erik@Waterboards <Erik.Ekdahl@waterboards.ca.gov>

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**Subject:** Electronic Transmittal: Report on Hydrologic Forecasting Improvements and Operations Outlook for TUC Orders Conditions 3 & 5

**EXTERNAL:**

Consistent with the February 15, 2022 and April 4, 2022 Temporary Urgent Change Orders (TUCOs) granted by the State Water Resources Control Board (SWRCB) to the U.S. Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR), and in compliance with Condition 3 and Condition 5 of those Orders (respectively), DWR and Reclamation hereby submit this report and Operations Outlook.

This Operations Outlook will also be posted to DWR's website under the Hydroclimate and Water Supply tab on DWR's Drought Preparedness web page.

Please contact me if you have questions.

Sincerely,

Tracy

Tracy Hinojosa  
Regulatory Compliance & Reporting Branch  
SWP Operations Control Office  
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2022 Operations Outlook (based on August projections)

**Accretions / Depletions (Condition 5b.)**

Values in TAF	April	May	June	July	August	September
Sacramento Valley	147	27	-62	-115	-151	-48
Net Delta Consumptive Use	80	111	150	223	232	147

Note: May-Sep Sac Valley values are negative to represent Depletion

**Deliveries (Condition 5c.&5d.)**

Values in TAF	April	May	June	July	August	September	Basis of Water Right or Contractual Agreement
SWP - Feather River Service Area	32	120	113	130	73	29	A005630, A014443, Feather River Settlement Agreements
SWP - North of Delta Contract Deliveries	0	1	3	2	1	1	A016950, A016952, A017514A, A021443
SWP - South of Delta Contract Deliveries	42	38	38	49	77	55	A005630, A014443, A014445A, A017512, A025435, A025511, A025988, A026058
CVP - Settlement Contractors	31.646	53.7	52.9	60.5	61.4	35.2	This is comprised of 75% of the Exhibit A quantities listed in the Settlement Contracts. It doesn't include the small Short Form Settlement Contracts. However, the Short Form Contracts only represent approximately 1.4% of the SRSC water quantities.
CVP- Sacramento River Agricultural Water Service Contractors	3	7	9	12	7	4	Water used by these contractors is part of the 75% allocated to the Settlement Contractors (allocation to NOD Water Service Ag Contractors is 0%.)
CVP- Sacramento River Municipal and Industrial Contractors	0.997	1.285	1.948	2.357	1.726	1.419	This includes the City of Redding's M&I Settlement Contract water and the McConnell Foundation and Centerville CSD's exchange water.
CVP- American River Municipal and Industrial Contractors	0.23	0.422	0.412	0.841	1.3	0	PHS for SMUD. Allocation to ARD CVP M&I Contractors is zero.
CVP - Contra Costa Water District	4.762	6.316	3.122	4.038	7.250	5.600	CVP M&I estimated scheduled diversions.
CVP - North of Delta Refuges	0.940	2.485	5.541	4.050	3.876	12.959	Includes Water to be Exchanged with DWR for Gray Lodge.
CVP - Exchange Contractors	34.072	72.907	102.405	118.825	99.47	67.576	Includes water being transferred to other districts, transfers are based on consumptive use reductions.
CVP - South of Delta Agricultural Water Service Contractors	0	0	0	0	0	0	Allocation to SOD Water Service Ag Contractors is 0%.
CVP - South of Delta Municipal and Industrial Service Contractors	2	3	6.676	9.842	8.832	6.819	Public Health and Safety Water only, consistent with M&I shortage policy
CVP - South of Delta Refuges	4.718	5.115	12.792	4.176	10.46	47.49	Refuge Water Supply Contract: 01WC201756, 01WC201758, 01WC201754
CVP - OID & SSJID (Stanislaus Basin) Water Right holders	50	65	72	81	TBD	TBD	1988 Operations Agreement
CVP - New Melones East Side Division Water Service Contractors (Stockton East, Central San Joaquin Water Conservation District)	0	0	0	0	0	0	Per Eastside Division Shortage Policy, Contractors' allocation is zero.
CVP Friant Unit Class I	4.138	6.775	9	15	50	26	Friant allocation went up in late July from 20% to 30%.

**Delta Flows (Condition 5b.)**

Values in cfs or TAF	April	May	June	July	August	September
Delta Inflow at Freepoint (cfs)	8282	7485	9140	11346	9454	8037
Net Delta Outflow Index (cfs)	7295	5682	6640	5796	3270	3016
SJR at Vernalis Flow (cfs)	944	719	707	270	175	160
CVP Export (TAF)	54	56	54	149	167	160
SWP Export (TAF)	36	32	17	15	14	18

**Transfers (Condition 5e.)**

Values in TAF	April	May	June	July	August	September
NOD to SOD (estimated)	N/A	N/A	N/A	31	36	13

**Reservoir Inflow (Condition 5a.)**

Values in TAF	April	May	June	July	August	September
Trinity	62	23	32	11	6	3
Whiskeytown	58	8	6	2	2	1
Shasta	252	175	177	150	143	130
Folsom	256	79	111	89	85	67
New Melones	74	25	46	17	17	25
Oroville	341	233	142	149	123	115

**Reservoir Releases (Condition 5a.)**

Values in TAF	April	May	June	July	August	September
Trinity Release to Trinity River	79	67	28	59	56	52
Carr Tunnel diversion	25	16	24	31	28	30
Whiskeytown to Clear Creek	12	12	12	9	9	9
Spring Creek Tunnel diversion	8	10	18	22	22	40
Shasta Release to Sac River	194	277	242	201	277	238
Folsom Release to American River	69	64	152	262	215	152
New Melones to Stanislaus River	27	25	49	18	15	14
Oroville	78	119	202	252	163	128

**Reservoir End-of-Month Storage (Condition 5a.)**

Values in TAF	April	May	June	July	August	September
Trinity	766	693	716	664	611	501
Shasta	1808	1646	1777	1683	1585	1479
Folsom	769	669	807	591	436	344
New Melones	922	831	784	711	636	638
Oroville	1907	1914	1722	1449	1304	1257
San Luis Reservoir	948	920	797	646	560	610

**Monthly COA Balances (Condition 5f.)**

Values in TAF	April	May	June	July	August	September
Monthly Balance	216	160	95	36	0	0

Does not include adjustment for New Melones

**San Luis Reservoir**

Values in TAF	April	May	June	July	August	September
Total Pumping	48	6	0	0	0	0
Total Generation	4	26	117	134		



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BUREAU OF RECLAMATION  
Central Valley Operations Office  
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Erik Ekdahl  
State Water Resources Control Board  
1001 I Street  
Sacramento, California 95814

Re: Condition 3 of the February 15, 2022 Temporary Urgency Change Order and  
Condition 5 of the April 4, 2022 Temporary Urgency Change Order

Dear Mr. Ekdahl:

Consistent with the February 15, 2022, Temporary Urgent Change Order (TUCO) by the State Water Resources Control Board (SWRCB) issued to the U.S. Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR), and in compliance with Condition 3 of the TUCO, DWR and Reclamation hereby submit this report by the State Water Project (SWP) and the Central Valley Project (CVP), also collectively referred to as Projects.

Condition 3 specifically requires DWR and Reclamation to identify and implement needed improvements to forecast methods to avoid significant over- or under- estimates of available water supplies and provide updates to the SWRCB on these efforts along with updates on current hydrologic and operational forecasts for the water year on a monthly basis starting in April of 2022 and continuing until the drought emergency is over.

Condition 3 also requires DWR and Reclamation to submit in writing monthly hydrologic and operational forecasts and include information on forecasted inflows; reservoir releases; water supply deliveries; reservoir storage levels; any Coordinated Operations Agreement debts; planned water transfers, forbearance agreement actions, exchanges, and other actions of this nature; and other relevant information that may be requested by the SWRCB's Executive Director to inform future drought-related decision making.

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In this letter, the Projects provide updates on current hydrologic and operational forecasts for the water year, as well as information on planned water transfers, forbearance agreement actions, and exchanges. The attached table, prepared in response to Condition 5 of the latest TUCO, issued April 4, 2022, includes the information on forecasted inflows; reservoir releases; water supply deliveries; reservoir storage levels; and Coordinated Operations Agreement debts.

### Forecasting Improvements

#### *Bulletin 120 Improvements*

The Snow Surveys and Water Supply Forecasting (SSWSF) team has continued with a variety of forecast improvement projects. Utilizing machine learning and other data automation techniques, the SSWSF team has been developing a more flexible suite of forecast tools that can consider a multitude of hydroclimate variables and optimize their use for a specific forecast date or hydrologic condition. Additionally, the team has been 1) developing new/improved forecast comparison tools, 2) considering irrigation and consumption constants in the Sacramento Valley to improve full natural flow calculations and better represent water availability, and 3) exploring the use of 6-day precipitation forecasts into the seasonal runoff projections.

#### *Airborne Snow Observatory (ASO)*

DWR has continued to work with its vendor to plan snow-free baseline LiDAR data collection over several Sierra Nevada and Southern Cascade watersheds. The snow-free data collection is vital to updating older LiDAR data sets in watersheds where ASO data collection has been active for a number of years. Additionally, DWR plans to add other Sacramento Valley watersheds to its Aerial Remote Sensing of Snow (ARSS) program this year including the watersheds above Lake Shasta (Upper Sacramento, McCloud, and Pit Rivers). Snow-free LiDAR flights are planned for these areas but are currently impacted by smoke and haze from the many fires in Six Rivers, Klamath, and Shasta-Trinity National Forests.

#### *UC Davis Watershed Environment Hydrology (WEHY) Forecast Model*

DWR has partnered with Hydrologic Research Laboratory at UC Davis in a proof-of-concept effort to evaluate the use of their WEHY model for use in improving seasonal runoff forecasts for the Inflow to Lake Shasta and the Feather River at Oroville. WEHY is a physical and process-based modeling tool that is coupled with regional atmospheric models like those used by the WRF-Hydro model DWR is developing with its ASO partners. WEHY factors in the variability in atmospheric inputs, surface water process components, and subsurface components (i.e., soil moisture and baseflow factors) through simulation of physical processes in a gridded model format over a specific watershed. Like WRF-Hydro, it mimics some of the processes that the

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California-Nevada River Forecast Center (CNRFC) uses in some of their forecasting processes. One feature of the WEHY model is its ability to assimilate NOAA weather and climate forecasts over the Sacramento River Basin and make seasonal snow forecast simulations using NOAA's downscaled climate forecasts.

### Projected Hydrology and Runoff

The DWR's Hydrology and Flood Operations Branch within the Division of Flood Management produces estimates of water year runoff, or the water supply index (WSI), for the major watersheds of the Sacramento and San Joaquin River basins. The WSI forecast is a statistically based forecast of Water Year runoff for each major river basin in the Sacramento and San Joaquin valleys (Sacramento, Feather, Yuba, American, Stanislaus, Tuolumne, Merced, and San Joaquin). The runoff forecasts are produced at the beginning of the month from December through May.

With the final weekly update of the Bulletin 120 on June 7, 2022, DWR's median forecast for the April through July runoff volume into Lake Oroville was 930 thousand acre-feet (TAF). As of the last week of July, the actual accumulated runoff to date into Lake Oroville since April 1, 2022, has been approximately 950 TAF. The final Water Supply Index (WSI) forecast was issued for conditions as of May 1, 2022.

For the Sacramento River Valley Type Index (SVI), the water year index (based on the 50% exceedance forecast) was 4.5, which places the SVI in the critical water year type. For the San Joaquin Valley Water Year Type Index (SJI), the water year index (based on the 75% exceedance forecast) was 1.5, which places the SJI in the critical water year type.

Although the final official Water Supply Index Bulletin 120 (B120) forecast was issued on May 1, 2022, the forecast provided in this submittal has been adjusted to account for observed conditions in June and July, and very dry conditions expected through September.

The Projects use the 90% exceedance forecast for the joint operations plan included in this report and the July Drought Plan addendum. The hydrologic forecast is unique to this water year and informed by precipitation, runoff, snowpack, and other antecedent hydrologic conditions, combined with the runoff associated with the antecedent conditions and the anticipated runoff resulting from precipitation forecasted to occur through September 30.

### SWP and CVP Operations Forecasts

The operations forecast uses the runoff forecast as model inputs to simulate Project operations under various regulatory requirements and produce forecasted reservoir storages, releases, and flows under the same hydrologic exceedances. This operation

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forecast gives general guidance for annual water delivery, storage management, and power planning purposes for this exceedance assumption. Actual hydrologic events unfold in time steps shorter than a month and are often unpredictable more than a few days to a week out. Daily operations are driven by operating criteria such as those found in U.S. Army Corps of Engineers flood control manuals, SWRCB D-1641 Bay-Delta Standards, the NMFS and USFWS Biological Opinions, and the ITP for the SWP. Outputs from the forecast model, as provided in this Drought Plan addendum, represent system responses to the overlay of specific expected monthly operating criteria on each of the discrete hydrologic scenarios provided in the May 1 water supply forecasts.

The forecast assumptions utilize existing storage conditions, actual runoff through June, forecasted runoff based on the May 1 B120 90% exceedance hydrology, projected water supply deliveries, and meeting existing flow and water quality standards, and fish and wildlife protections. The forecast includes monthly storage levels, reservoir releases, Delta export rates, and Delta outflow through September 30, 2022. DWR and Reclamation will continue to update the operations forecasts each month, and expect that with each updated operations forecast, SWP and CVP operations may change.

#### Planned Transfers, Forbearance Agreement Actions, Exchanges

As of August 22, 2022, eight groundwater substitution transfer proposals (five from the Feather River watershed and three from American River watershed) have been submitted to DWR's online database system Water Transfers Information Management System and have been deemed complete to proceed to the Storage and Conveyance Agreements. In addition, two reservoir release transfer proposals were submitted (one from Feather River and one from American River watersheds, respectively). There are no transfers or forbearance agreement actions from the Sacramento River Settlement Contractors to water users south of the Delta. In-Basin transfers have and will continue to occur between various contractors north of the Delta under the accelerated water transfers program. This will not affect or alter planned releases from Keswick nor exceed the quantities of water made available for delivery this contract year among the in-Basin Sacramento River Settlement contractors. Table 1 below shows the estimated maximum quantity of short-term transfers in various watersheds with the method to make water available to transfer.

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Table 1: Estimated Maximum Quantity of Short-Term Transfers (acre-feet before any losses) as of August 22, 2022

Method to Make Water Available for Transfer	Feather River	American River	Total
Groundwater Substitution	15,787	15,494	31,281
Reservoir Release	10,000	21,053	31,053
<b>Total</b>	<b>25,787</b>	<b>36,547</b>	<b>62,334</b>

On July 22, 2022, Yuba Water Agency provided the latest update for a total of approximately 74,864 acre-feet of the Yuba Accord water transfer in 2022. Table 2 below shows the estimated Lower Yuba River Accord Component water quantity to DWR and Reclamation Participating Contractors. The total quantity will be updated periodically during the transfer year.

Table 2: Estimated Lower Yuba River Accord Component Water (acre-feet before any losses)

Estimated Lower Yuba River Accord Component Water Quantity (acre-feet before any losses)	
Component 1	12,464
Component 4	62,400
<b>Total</b>	<b>74,864</b>

Ongoing exchanges through the Consolidated Place of Use (CPOU) between the two Projects continue to be reported through the CPOU monthly reports. As authorized under the 2022-2023 CPOU order, the total quantity of transfers and exchanges will not exceed 393,385 acre-feet from July 22, 2022 through July 21, 2023.

If you have any questions, please contact Molly White of DWR at (916) 574-2722 or Kristin White of Reclamation at (916) 979-2199.

Sincerely,

*Molly White*

Molly White, Manager  
Water Operations Branch  
Division of Operations and Maintenance  
Department of Water Resources

*Kristin White*

Kristin White, Operations Manager  
Central Valley Operations Office  
Bureau of Reclamation

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Attachment

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