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Subject: Modified Temporary Urgency Change Order Condition 8

EXTERNAL:

The Department of Water Resources (DWR) and U.S. Bureau of Reclamation (Reclamation) are providing the following information on the hydrodynamics of the Delta in response to Condition 8 of the Temporary Urgency Change Order (TUCO) issued on February 21, 2023 and modified on March 9, 2023.

The Port Chicago X2 objective can be met through electrical conductivity or outflow. Specifically, a day of compliance is accrued for each day when the daily electrical conductivity (EC) at Port Chicago is 2.64 mmhos/cm or less, the 14-day average EC at Port Chicago is 2.64 or less or three-day average outflow (NDOI) is 29,200 cfs or greater.

Condition 8 of the TUCO requires the Projects to calculate and maintain a record of the change in Delta outflows, the change in the location of X2, and the volume of additional exports under the changes approved in the TUCO as compared to without the changes. The attached table shows observed exports and NDOI values along with estimated NDOI values calculated to maintained the 3-day average NDOI above 29,200 cfs during the month of February 2023. (This modeled NDOI was calculated by modifying the flows on the Sacramento River at Freeport and the combined exports to the DWR and Reclamation in the south Delta, and the attached table includes observed and estimated Freeport flows and Project exports associated with each scenario.)

The difference in X2 location with and without the TUCO was estimated by applying the Autoregressive Lag Model used by the DayFlow Program to both the observed NDOI and the modeled NDOI.

$$X2(t) = 10.16 + 0.945 * X2(t-1) - 1.487 \log(NDOI(t))$$

where t = current day and t-1 = previous day

As reflected in the attached table, Reclamation and the DWR have determined that to continue accumulating days toward Port Chicago compliance in the absence of the TUCO, NDOI would have had to be modified beginning on February 5 due to uncertainty in the EC around Port Chicago. To maintain the 3-day average NDOI above 29,200 cfs, an anticipated 500 TAF of additional NDOI would have been needed over the course of the month. Of that additional volume, 176 TAF would likely have come from reductions in combined exports. With the reduction in required NDOI, DWR was able to increase water supply allocations to State Water Project Contractors by 5%, where South of Delta Contractors increased from 30% to 35%. There was no change in water supply allocations for the Northern Water Settlement Contractors, Refuges, and the San Joaquin Exchange contractors with and without the TUCO. All parties were allocated 100% on Feb. 22, 2023. Municipal and Industrial contractors have an allocation of 75% both with and without the TUCO. The only difference in allocations would have been for the north of Delta and south of Delta water service contractors. Without the TUCO, they would have received an Allocation of 30%. With the TUCO, their allocation was 35%.

The location of X2 was approximately 62 km on January 31, 2023. With the application of the Autoregressive Lag Model to both the observed and modeled NDOI, the X2 location without the TUCO is estimated to have been 4.1 km further downstream than it was with the TUCO. If the difference between the results of the Autoregressive Lag Model were added to the observed X2 for each of the last 14 days of February, the resulting X2 for all 14 days would still have been at or greater than 64 km, even without the TUCO. Therefore, X2 is estimated to be at or upstream of Port Chicago in terms of both the 14-day EC and the daily EC at the end of February. In other words, the downstream movement of X2 under the without TUCO condition would not have triggered the Port Chicago requirement for March 2023.

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Date	Observed Daily Combined Exports (cfs)	Observed Freeport Flow (Previous Day) (cfs)	Observed Daily NDOI** (cfs)	Observed 3-Day Average NDOI** (cfs)	Estimated Additional Daily NDOI** to Meet Port Chicago X2 (cfs)	Modeled Daily NDOI** (cfs)	Modeled 3-Day Average NDOI** (cfs)	Modeled Daily Combined Exports (cfs)	Modeled Freeport Flow (Previous Day) (cfs)	Observed X2 Location (km)	DayFlow* X2 based on Observed NDOI (km)	DayFlow* X2 based on Modeled NDOI (km)	Difference in DayFlow* X2 Locations (km)	Cumulative Change in NDOI** (af)	Cumulative Change in Exports (af)
2/1/2023	10,718	24,494	28,318	31686	0	28,318	31,686	10,718	24,494	63.7	62.2	62.2	0	0	0
2/2/2023	10,394	22,996	25,390	28362	0	25,390	28,362	10,394	22,996	66.5	62.3	62.3	0	0	0
2/3/2023	9,924	21,612	23,117	25608	0	23,117	25,608	9,924	21,612	68.7	62.6	62.6	0	0	0
2/4/2023	9,417	20,794	21,487	23332	0	21,487	23,332	9,417	20,794	68.9	62.9	62.9	0	0	0
2/5/2023	8,794	20,686	21,126	21910	5,093	26,219	23,608	3,701	20,686	69.6	63.1	63.0	0.1	10,103	10,103
2/6/2023	8,567	20,415	21,184	21266	6,270	27,455	25,054	2,297	20,415	66.7	63.4	63.1	0.3	22,539	22,539
2/7/2023	8,354	21,023	21,814	21375	9,078	30,892	28,189	2,295	24,042	65.1	63.6	63.1	0.5	40,545	34,556
2/8/2023	7,172	21,302	22,578	21859	6,898	29,476	29,274	3,296	24,325	63.7	63.8	63.1	0.7	54,227	42,244
2/9/2023	8,254	21,928	21,832	22075	7,006	28,838	29,735	4,298	24,978	62.9	64.0	63.2	0.8	68,123	50,090
2/10/2023	8,215	21,859	21,506	21972	8,470	29,975	29,430	2,795	24,909	63.8	64.2	63.2	1.0	84,923	60,840
2/11/2023	8,037	20,888	20,327	21222	8,790	29,117	29,310	2,297	23,938	63.7	64.4	63.3	1.1	102,359	72,226
2/12/2023	7,858	20,613	19,671	20501	9,112	28,783	29,292	2,296	24,163	66.1	64.7	63.3	1.3	120,432	83,258
2/13/2023	7,670	19,893	18,662	19553	11,405	30,067	29,322	2,296	25,924	67.4	64.9	63.3	1.6	143,053	93,917
2/14/2023	7,505	19,382	18,033	18789	11,244	29,277	29,376	2,293	25,415	67.7	65.2	63.4	1.8	165,357	104,254
2/15/2023	7,419	19,178	17,541	18079	11,561	29,102	29,482	2,297	25,617	65.6	65.4	63.4	2.0	188,287	114,413
2/16/2023	7,263	18,541	16,807	17460	12,502	29,309	29,229	2,296	26,076	68.3	65.7	63.4	2.3	213,086	124,266
2/17/2023	7,034	18,018	16,279	16875	13,278	29,556	29,322	2,295	26,557	70.3	66.0	63.5	2.5	239,422	133,665
2/18/2023	4,990	17,630	17,694	16926	11,727	29,421	29,429	2,297	26,665	71.6	66.2	63.5	2.7	262,683	139,005
2/19/2023	4,999	17,235	17,007	16993	12,236	29,243	29,407	2,296	26,768	71.9	66.4	63.5	2.9	286,953	144,366
2/20/2023	5,494	16,883	16,026	16909	13,231	29,257	29,307	2,296	26,916	71.4	66.7	63.5	3.1	313,197	150,710
2/21/2023	5,588	16,605	15,518	16184	13,830	29,347	29,282	2,295	27,142	72.4	66.9	63.6	3.4	340,628	157,240
2/22/2023	5,586	15,535	14,292	15279	14,822	29,114	29,240	2,294	27,066	71.5	67.2	63.6	3.7	370,028	163,768
2/23/2023	5,585	15,857	14,435	14748	15,324	29,758	29,407	2,295	27,891	70.9	67.5	63.6	3.9	400,422	170,293
2/24/2023	4,993	15,472	14,668	14465	14,725	29,393	29,422	2,297	27,502	70.8	67.8	63.6	4.2	429,630	175,639
2/25/2023	4,892	15,899	17,193	15432	12,006	29,199	29,450	4,892	27,905	69.6	67.9	63.6	4.3	453,444	175,639
2/26/2023	5,101	17,091	20,995	17619	10,534	31,529	30,040	5,101	27,625	69.8	67.9	63.6	4.3	474,338	175,639
2/27/2023	6,196	17,956	21,874	20021	8,100	29,974	30,234	6,196	26,056	69.3	67.9	63.6	4.3	490,404	175,639
2/28/2023	6,305	20,625	29,455	24108	5,553	35,008	32,170	6,305	26,178	68.9	67.7	63.5	4.1	501,419	175,639

*X2 is estimated using the Autoregressive Lag Model used in the DayFlow Program:
 $X2(t) = 10.16 + 0.945 \cdot X2(t-1) - 1.487 \log(QOUT(t))$
where t = current day and t-1 = previous day
X2 for 1/31 assumed to be 62 km

**NDOI is the Net Delta Outflow Index calculated as defined in Figure 3 of D1641.

Observed flows used in this table have been reported on the linked site

<https://water.ca.gov/Programs/State-Water-Project/Operations-and-Maintenance/Operations-and-Delta-Status>