Appendix 5C

Proposed Project Surface Water Quality Effects with Early Spring Outflow Implementation

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This appendix is entirely new for the Final Environmental Impact Report and was not included as part of the Draft Environmental Impact Report. Therefore, it is not provided in strikethrough or underline format.

5C.1 Appendix Overview

This appendix presents analysis of the effects of the Proposed Project with Early Implementation of Spring Outflow (also referred to as Proposed Project Incidental Take Permit [ITP] Spring Outflow) on surface water quality in the study area. For the reasons provided for the Proposed Project in Chapter 5, "Surface Water Quality," this appendix addresses effects of the Proposed Project with Early Implementation of Spring Outflow on the salinity-related parameters electrical conductivity (EC) and chloride, and cyanobacteria harmful algal blooms (CHABs) in the Sacramento–San Joaquin Delta (Delta), Suisun Marsh, and Suisun Bay. This scenario represents implementation of the Proposed Project prior to approval of the Healthy Rivers and Landscapes Program (formerly Voluntary Agreements Program) by the State Water Resources Control Board. The Proposed Project with Early Implementation of Spring Outflow scenario includes the operations described in Chapter 2, "Project Description" with the Spring Delta Outflow component described in Section 2.3.5.2, "Early Voluntary Agreement Implementation," which is the current spring outflow requirement identified in the 2020 *Incidental Take Permit for the Long-Term Operation of the State Water Project in the Sacramento–San Joaquin Delta* (California Department of Water Resources 2020).

5C.2 Methods of Analysis

The analysis in this appendix is supported by modeling results from CalSim 3. Details of the CalSim 3 modeling, including model development and input, are provided in Appendix 4A, "Model Assumptions," Attachment 1, "Model Assumptions." Additional information regarding the modeling assumptions specific to the Proposed Project ITP Spring Outflow scenario is provided in Appendix 4L, "Proposed Project with Early Implementation of Spring Outflow."

5C.3 Electrical Conductivity and Chloride

The potential effects of the Proposed Project ITP Spring Outflow on Delta EC would be similar to those described for the Proposed Project in Chapter 5 as demonstrated by the similarity in the CalSim 3-modeled EC relative to Baseline Conditions.

CalSim 3-modeled EC for the Sacramento River at Emmaton, San Joaquin River at Jersey Point, and Old River at Rock Slough under Proposed Project ITP Spring Outflow are presented in Tables 5C-1 through 5C-3 and Figures 5C-1 through 5C-3. The modeling results in these tables show a difference in EC of 2 percent or less at these locations compared to Baseline Conditions, similar to the difference between the Proposed Project and Baseline Conditions. Chloride concentrations are correlated with EC levels. Therefore, under the Proposed Project ITP Spring Outflow, chloride concentrations also would be similar to Baseline Conditions and those described in Chapter 5 for the Proposed Project at these locations and throughout the Delta. Based on the small modeled differences in EC, and the correlated small differences in chloride concentrations, the Proposed Project ITP Spring Outflow would not substantially degrade water quality with regard to EC or chloride on a long-term average basis in the Delta that would result in substantially increased risk for adverse effects on any beneficial uses.

Furthermore, with the Proposed Project ITP Spring Outflow, there would be no additional exceedance of the *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta WQCP) EC or chloride objectives, which are implemented through State Water Resources Control Board Water Right Decision 1641 (D-1641). As described for the Proposed Project in Chapter 5, with the Proposed Project ITP Spring Outflow, actual decisions associated with real-time system operations are conducted on a daily timestep for compliance with D-1641.

The similarity of EC under the Proposed Project ITP Spring Outflow to Baseline Conditions coupled with the differences in Delta outflow described in Appendix 4L indicate that this scenario also would not contribute to substantial changes in Suisun Marsh and Suisun Bay EC or chloride, or adverse effects on beneficial uses of these waters.

In summary, the Proposed Project ITP Spring Outflow would not cause substantial increases in EC or chloride in study area waterbodies relative to Baseline Conditions. Furthermore, the Proposed Project ITP Spring Outflow would not cause additional exceedance of applicable EC and chloride water quality objectives by frequency, magnitude, and geographic extent that would result in adverse effects on any beneficial uses of study area waterbodies. Because EC and chloride levels are not expected to increase substantially, the Proposed Project ITP Spring Outflow would not cause long-term degradation of EC or chloride in study area waterbodies that would result in substantially increased risk for adverse effects on any beneficial uses. Therefore, the impact of the Proposed Project with Early Implementation of Spring Outflow Project on EC would be less than significant.

5C.4 Cyanobacteria Harmful Algal Blooms

As detailed in Chapter 5, the factors that provide favorable conditions for CHAB development in study area waterbodies are: (1) water temperature, (2) channel velocities and associated turbulence/mixing (3), residence time, (4) nutrients, and (5) water clarity and its effects on irradiance. Salinity also is a factor in CHAB presence in Suisun Marsh and Suisun Bay.

As described in Appendix 4L, Sacramento River, Yolo Bypass, Delta Cross Channel, Qwest, combined Old and Middle River flows, and Delta exports under the Proposed Project ITP Spring Outflow would be similar to the Proposed Project, and differ little from Baseline Conditions. The similar inflows, outflows, and exports indicate that water temperature, channel velocities, residence times, nutrient levels, and water clarity of water in the various Delta channels under Proposed Project ITP Spring Outflow would not differ substantially from the Proposed Project or Baseline Conditions. Since there would be little to no change in Delta water temperature, nutrient levels, and water clarity the Proposed Project ITP Spring Outflow also would have little to no effect on these parameters in Suisun Marsh and Suisun Bay. The Proposed Project ITP Spring Outflow would have small effects on Delta outflow, and therefore would not change hydrodynamics in Suisun Marsh or Suisun Bay such that hydrodynamics and residence times in these waterbodies would differ sufficiently to encourage more frequent CHABs compared to Baseline Conditions.

As described in Section 5C.3, “Electrical Conductivity and Chloride,” EC levels in the Delta under Proposed Project ITP Spring Outflow would also be similar to Baseline Conditions. The modeled small changes in Delta EC would not cause Suisun Marsh or Suisun Bay water to decrease in salinity such that they would be more conducive to supporting CHAB growth, accumulation, or aggregation relative to Baseline Conditions.

Finally, because the Proposed Project ITP Spring Outflow is not expected to substantially affect CHAB magnitude anywhere in the Delta, this scenario would not change cyanotoxin concentrations in Delta outflows by measurable levels and would not affect levels in Suisun Marsh and Suisun Bay sufficiently to be measurable or result in any adverse effect on beneficial uses of these waterbodies.

Because the Proposed Project ITP Spring Outflow would not substantially change any of the drivers of CHABs in the study area waterbodies, the Proposed Project ITP Spring Outflow would have negligible, if any, effects on the frequency and magnitude of CHABs in the Delta, Suisun Marsh, or Suisun Bay relative to Baseline Conditions. Any small changes in these conditions that may occur would not be of sufficient frequency and magnitude to cause CHABs to form more frequently, or grow to larger levels, than would occur for Baseline Conditions. Therefore, the impact of the Proposed Project ITP Spring Outflow on CHABs in the Delta, Suisun Marsh, and Suisun Bay would be less than significant.

Table 5C-1. CalSim-Modeled Average Electrical Conductivity (in micromhos/cm) for the Sacramento River at Emmaton by Water Year Type, Water Years 1922–2021, Proposed Project ITP Spring Outflow

Water Year Type	Baseline Conditions	Proposed Project	Difference from Baseline Conditions: Proposed Project	Proposed Project ITP Spring Outflow	Difference from Baseline Conditions: Alternative 1
Wet	524	534	10 (2%)	532	8 (2%)
Above Normal	610	617	7 (1%)	618	8 (1%)
Below Normal	759	764	5 (1%)	760	1 (0%)
Dry	948	958	10 (1%)	963	15 (2%)
Critically Dry	1,558	1,572	14 (1%)	1,561	3 (0%)

Source: DRAFT_TrendReport_MultiCalSim_rev12_FEIR_1_9bITPSpring_7.23.0.

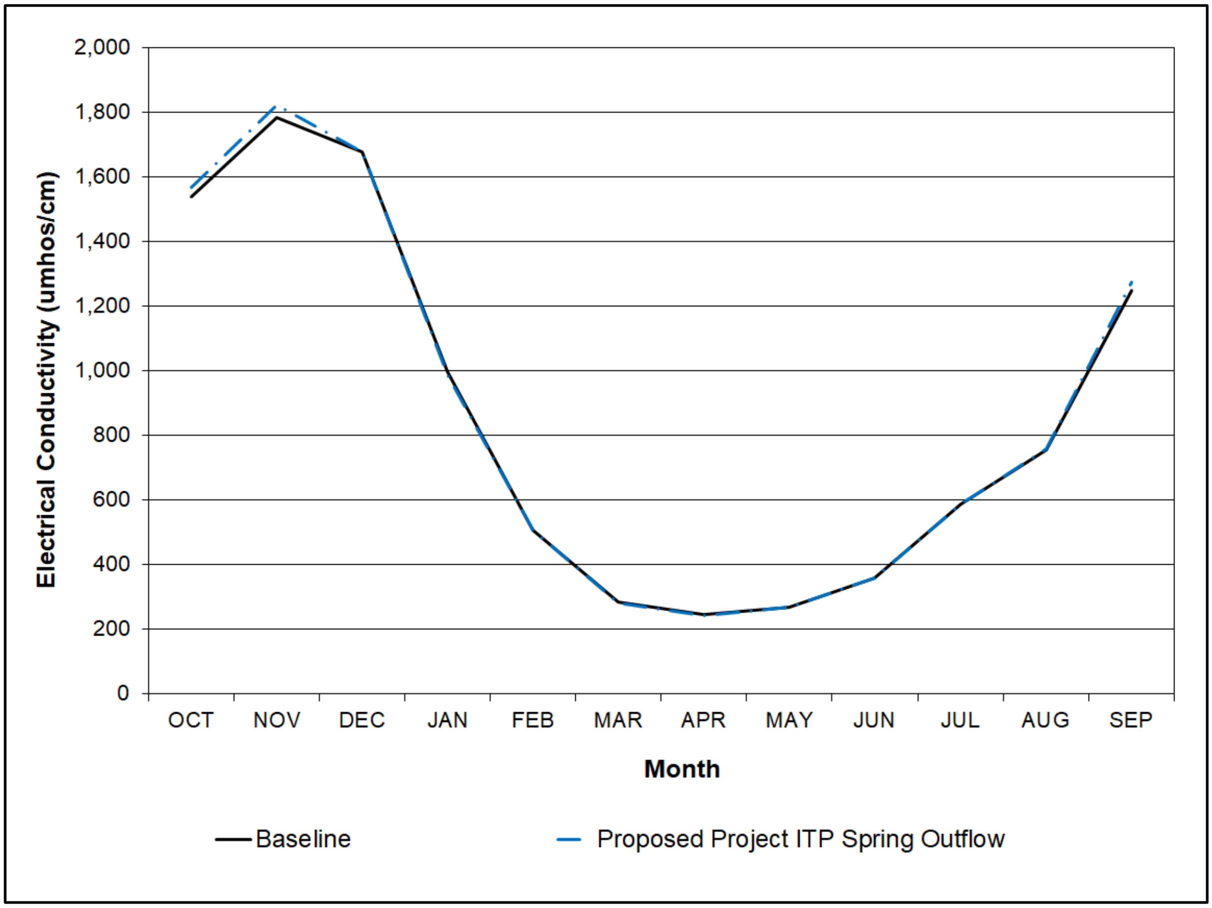

Figure 5C-1. CalSim-modeled Monthly Average Electrical Conductivity (in micromhos/cm) for the Sacramento River at Emmaton, Water Years 1922–2021, Proposed Project ITP Spring Outflow

Table 5C-2. CalSim-Modeled Average Electrical Conductivity (in micromhos/cm) for the San Joaquin River at Jersey Point by Water Year Type, Water Years 1922–2021, Proposed Project ITP Spring Outflow

Water Year Type	Baseline Conditions	Proposed Project	Difference from Baseline Conditions: Proposed Project	Proposed Project ITP Spring Outflow	Difference from Baseline Conditions: Alternative 1
Wet	516	524	8 (2%)	525	9 (2%)
Above Normal	570	580	10 (2%)	583	13 (2%)
Below Normal	714	719	5 (1%)	718	4 (1%)
Dry	802	812	10 (1%)	814	12 (1%)
Critically Dry	1,025	1,034	9 (1%)	1,027	2 (0%)

Source: DRAFT_TrendReport_MultiCalSim_rev12_FEIR_1_9bITPSpring_7.23.0.

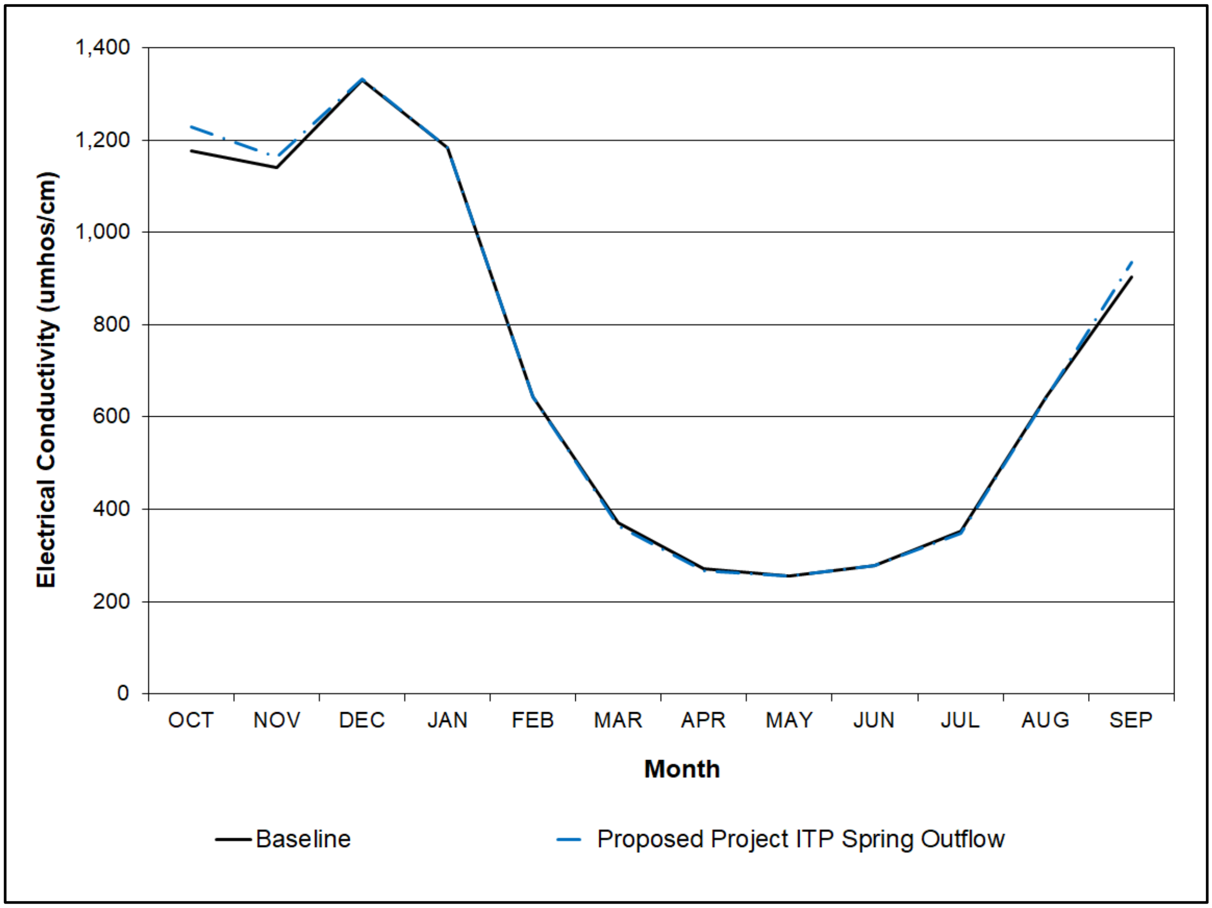

Figure 5C-2. CalSim-modeled Monthly Average Electrical Conductivity (in micromhos/cm) for the San Joaquin River at Jersey Point, Water Years 1922–2021, Proposed Project ITP Spring Outflow

Table 5C-3. CalSim-Modeled Average Electrical Conductivity (in micromhos/cm) for the Old River at Rock Slough by Water Year Type, Water Years 1922–2021, Proposed Project ITP Spring Outflow

Water Year Type	Baseline Conditions	Proposed Project	Difference from Baseline Conditions: Proposed Project	Proposed Project ITP Spring Outflow	Difference from Baseline Conditions: Alternative 1
Wet	339	340	1 (0%)	342	3 (1%)
Above Normal	369	372	3 (1%)	375	6 (2%)
Below Normal	432	431	-1 (0%)	436	4 (1%)
Dry	456	459	3 (1%)	460	4 (1%)
Critically Dry	548	552	4 (1%)	551	3 (1%)

Source: DRAFT_TrendReport_MultiCalSim_rev12_FEIR_1_9bITPSpring_7.23.0.

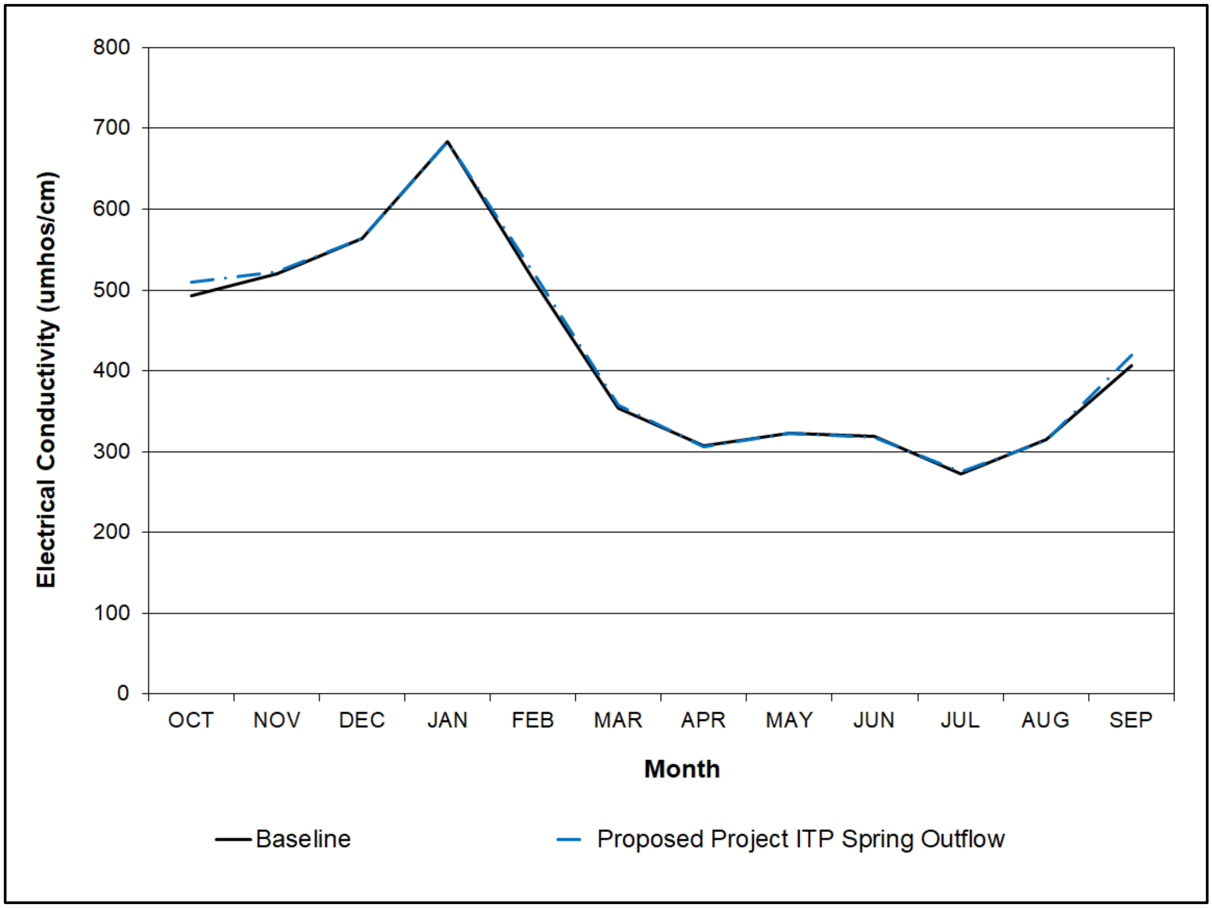

Figure 5C-3. CalSim-modeled Monthly Average Electrical Conductivity (in micromhos/cm) for the Old River at Rock Slough, Water Years 1922–2021, Proposed Project ITP Spring Outflow