Date: 9/9/24

To: California Department of Water Resources

From: Delta Independent Science Board

Subject: Comments on the Final Environmental Impact Report for the Delta Conveyance Project

As part of its legislative mandate to provide scientific oversight of the scientific research, monitoring, and assessment programs that support adaptive management of the Delta, the Delta Independent Science Board (Delta ISB) provided a review of the draft Environmental Impact Report (EIR) for the Delta Conveyance Project to the California Department of Water Resources in December 2022. In December 2023, the California Department of Water Resources released its final EIR and certified it. The Delta ISB reviewed the final EIR and would like to bring forward some concerns to help inform the Department on its analysis as the project goes through other regulatory processes.

Priority concerns

Although some minor changes were made in response to our comments, the responses generally did not lead to meaningful changes to the EIR for the Delta Conveyance Project and the Delta ISB stands by many of its original concerns of the draft EIR. We detail some substantive concerns in the second section of this letter, "Major themes of Delta ISB concerns." In this section, we take issue with three recurring responses, as detailed below.

1. The first recurring response that concerns the Delta ISB is, *"The Delta Conveyance Project EIR has been prepared in compliance with CEQA and evaluates the full range of potential impacts that may result from construction, maintenance, and operation of the proposed project and alternatives."* While more detailed responses to some comments were provided in the Common Reponses documents, the general theme remained that a common DWR reaction to ISB comments was that no revisions were needed because the original analyses in the EIR complied with CEQA. We are not commenting on CEQA compliance, rather, we are concerned about the lack of attention to sources of uncertainty including changing system conditions that lead to questions about the application of the analysis to

understand future conditions. Further, many DWR response comments say that conducting analyses to represent conditions that diverge from average or typical conditions would be too "speculative." Omitting analysis of atypical conditions may provide inaccurate and ineffective scientific information for decision support under a rapidly changing environment, as historically atypical conditions become more common.

2. The second recurring response of concern to the Delta ISB is that review comments, even when they have merit, fall outside of CEQA requirements and therefore can be dismissed. However, we note that the EIR includes analyses that go beyond CEQA requirements, such as evaluating flood risks to the year 2072 and including climate change drivers in analyses. In some cases, the ISB comments that were dismissed were intended to improve these extra analyses by capturing an appropriate range of potential future conditions.

   Similarly, the comment that "adaptive management is not required under CEQA" is concerning given the certain challenge of adapting operations and restoration to achieve the coequal goals for the Delta. We understand that other policies will address adaptive management requirements (e.g., the Delta Plan), but some environmental risks can only be bounded by evaluating the quality of the adaptive management plan. Adaptive management plans that included data collection and analysis processes, decision triggers, stakeholder engagement methods, funding, and other details would provide more confidence in the conclusions regarding impacts to biota (Wiens et al. 2017, Kotamaki et al. 2024).

3. The third recurring response of concern is that "CEQA requires a discussion of socioeconomic effects only if they would result in physical changes to the environment." While we acknowledge CEQA may not require it, we note that separating people from the environment is inconsistent with fully assessing impacts on people that may result from environmental change. As represented in the efforts of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, "…the NCP [Nature Contributing to People] approach recognizes the central and pervasive role that culture plays in defining all links between people and nature." (Diaz et al. 2018). Environmental impacts arise from human activities and behaviors and

ecosystem changes can profoundly influence the ability of people to thrive socially and economically.

Major themes of Delta ISB concerns

The following themes represent the high priority improvements to the environmental analyses that would be needed to address major Delta ISB comments as the Delta Conveyance Project continues to progress through the regulatory process. The Delta ISB acknowledges that these priorities do not reflect the adequacy of the final EIR's compliance with CEQA. Instead, addressing these would significantly increase confidence that uncertainties and potential model biases were well explored.

A few of the Delta ISB comments included here were also made in a separate detailed review (Rose et al. 2024), conducted by the Delta Science Program (DSP), that examined a draft version of the Effects Analysis being used by the US Bureau of Reclamation (Reclamation) as part of their preparation of an Environmental Impact Statement (EIS) and Biological Assessment (BA) for the Long-term Operations of the Central Valley Project (CVP) and the State Water Project (SWP). Many of the models and analyses performed for the EIR to assess effects on listed fish species use the same models and methods that were used in the Reclamation's Effects Analysis. For example, both analyses used the same models, and in some cases the same runs, of: CALSIM-3; DSM2; HEC-5Q; several egg-mortality models; and species-specific salvage-density, salvage-OMR, and abundance-outflow correlation relationships. Further, in both analyses, CALSIM-3 outputs were used as inputs to the effects models, and effects were presented with predictions grouped into water-year types and compared across alternatives for each type.

We have included comments from the Effects Analysis review, which occurred after the EIR review, when they were similar to Delta ISB comments or when they provided elucidating details for prior ISB comments. We find the review relevant because when two independent scientific peer reviews that involve different expert reviewers generate the same comments, it adds credence and weight to those concerns. The comments in common between the two independent reviews are noted where relevant.

Climate change is not realistically represented when projecting watershed hydrologic and ecosystem responses

Common Response 9 says that the *"EIR recognizes that climate conditions in California are nonstationary, and that past climate conditions and weather sequences are not good indicators of future (2040) conditions."* Yet, the methods used to project climate change effects on future water inflows, which were used to modify historical time series by monthly change factors ("perturbations"), are not providing a realistic representation of the future, given the expected implications of climate change. For instance, under warmer conditions, seasonal patterns of tributary inflows would change and have significant implications for operations of the upstream reservoirs. Other examples are that an increased frequency of drought periods within a year and more years of severe drought are not represented with this method.

The Delta ecosystem has undergone, and continues to undergo, changes in its productivity and structure, both from proximate stressors and from climate change. It is possible that a model developed from an earlier period was built upon relationships that no longer apply as strongly as they once did or other factors that were previously unimportant may have increased in their importance. While improving future projections is a major challenge, at minimum, the effect of uncertainty should be clearly documented and used to interpret results. The potential range of future conditions can be represented using a variety of climate scenarios that are plausible over the project lifespan and represent changing system conditions. This same concern was raised in the DSP peer review of the Draft Effects Analysis for the EIS/BA as part of Comment 6 and Model Reviews (A) and (C) where reviewers noted that using monthly-level outputs to determine fish habitat conditions can misrepresent relevant habitat changes.

Time and space scales of the models and analyses used to project important ecological outcomes are mismatched

The disparity in temporal scale between the primary regional hydrologic model, CALSIM 3, and other ecological modeling tools, such as DSM2, HEC-5Q, LTGEN, and SALMOD, creates a major source of uncertainty and potential bias (underestimation) in the projected effects on fish. For instance, the ecological modeling tools necessitate that flows and water levels be depicted at a higher temporal resolution than the monthly time step used to generate flows by CALSIM

3. Simply adjusting CALSIM 3 to daily or subdaily time steps by assuming the same values every day or per time step within the month, termed "downscaling" in the EIR, does not capture the temporal variability that is often crucial for using the flows as inputs to fish effects models and other models. Flow variability that might be represented as maximums or minimums, variance, and autocorrelation of the within-month distribution, are needed to accurately predict ecological effects. A good illustration of this concept is provided by Vasseaur et al. (2014) who show that the same shift in mean temperature, with different variances around the means, generates very different responses in physiological performance of fish. Labeling this issue merely as a modeling limitation fails to instill the necessary confidence in the scientific validity of the results. Ways of statistically adding realistic variability to the monthly values generated by CALSIM 3, and further application of other models in use (e.g., DSM2), to convert monthly values to daily and finer, should be explored to more realistically and more accurately represent potential effects on fish.

The issue of needing high resolution predictions as inputs to fish effects models is widely recognized and has been addressed elsewhere. Regional models of large-scale water systems with higher temporal resolutions (e.g., daily) are routinely employed for regulatory and planning purposes in other systems. For instance, in the Everglades, a system comparable in complexity to the California Bay-Delta system, regional hydrologic models equipped with the ability to simulate rainfall-runoff processes, system-wide flows, and crucially, operational rules of water control systems at a daily time step, are extensively utilized. This concern is also discussed in the DSP peer review of the Draft Effects Analysis for the EIS/BA as Comment 11.

Seismic risk may be overstated

The Delta ISB remains concerned that the EIR discussion of the seismic hazard in the Delta is misleading, as explained in our original comments and in the appendix. The potential overestimation of seismic risk may distort the project's potential benefits. The primary issue is the EIR's references to the U.S. Geological Survey reports of the 30-year probability of a magnitude 6.7 or greater earthquake in the San Francisco Bay Area. This probability applies to the greater Bay Area and not to the Delta, which the EIR implies. Citing the Bay Area earthquake probability misleads the reader that the Delta has a higher seismic hazard than Delta-specific studies have documented (see additional details in Appendix). In particular, the DRMS (2008) investigation supported by DWR concluded that: (1) the seismic hazard in the Delta derived primarily from blind thrusts in the Delta and (2) the major seismic sources in the Bay Area were too distant and unlikely to have a major impact. The probability of the blind thrust faults beneath the Delta seismically rupturing was concluded to be much lower than the major Bay Area seismic sources.

The seismic hazard in the Delta is described and remains unedited in three chapters. Chapter 1 (Introduction) cites a 72% Bay Area 30-year probability of a magnitude 6.7 or greater earthquake and implies this applies to the Delta. Chapter 10 (Geology and Seismicity) cites the 72% probability and does a better job of portraying the true seismic hazard in the Delta, although the text is still misleading as it refers to the Bay Area sources. Also confusing is the description of seismic potential in Chapter 7 (Flooding) that references an outdated U.S. Geological Survey report that concluded there was a 62% Bay Area 30-year probability of a magnitude 6.7 or greater earthquake. Chapter 7 compounds the misinformation by stating there is a 30-year probability of 62% of a magnitude 6.7 or greater earthquake in the Delta. The Delta ISB also is not aware of the source for the sentence: "*Seismologists believe it is likely that the Delta will experience periodic moderate to large earthquakes (magnitude 6.5 or greater) in the next 50 years."* (page 10-15 of Chapter 10). Because of the significance of the claim, its source(s) should be documented.

Important effects on fish species and aquatic ecosystem functions may be mischaracterized or missing

The EIR analyses generated few (if any) project effects that are deemed ecologically significant after mitigation. However, we question whether effects are fully captured by the methods used. A specific concern is that there is insufficient synthesis of how the life stage-specific effects will combine to result in population and higher level (community, food web) responses, potentially mischaracterizing impacts. The approach to examining fish population effects of listing the significance of combined effects of stressors for a life stage and then effects over life stages for a species, falls short of an effective synthesis of effects over a fish lifespan. The life cycle models provide a partial solution but not all effects are included in the life cycle models, and no life cycle models were used for most of the species. This comment also appears in the DSP peer review of the Draft Effects Analysis for the EIS/BA as Comment 15.

Similarly, while some fish effects synthesis is presented using the “significance of impacts” approach, it uses universally applied thresholds (e.g., 5%) and stops before population and higher-level responses can be determined. Using a more ecologically meaningful community or food web perspective might alter species responses and generate different results, as effects often depend on food web interactions, feedback between trophic levels, and other changes in patterns and processes that can affect species and their habitats. This broader ecological analysis approach will also allow for assessing effects on other ecosystem interactions besides population dynamics of selected fish species, such as nutrient cycling, energy transfer pathways, pelagic-benthic coupling, and measures of community and food web structure.

Water quality effects on biota and people lacked some important details. Operations and climate change have the potential to change Sacramento River flow, and associated source water contributions, during summer and fall. These changes may affect transport, dilution (concentrations), and distribution of contaminants from upstream, in-Delta and downstream sources. In addition, changes in conductivity and water temperature due to project operations can change absorption and toxicity of contaminants in aquatic species (Brooks et al. 2011, DeLorenzo 2015).

Further, water diversions can impact ecological productivity, decomposition, and resilience through the Sacramento River ecosystem. Flow supports primary and secondary productivity that is essential for maintaining biological organisms and essential ecosystem interactions. Diverting water can alter functions such as decomposition and biogeochemical processes regulating nutrient availability and underpinning ecological productivity. Such characteristics are essential in establishing environmental resiliency but are not addressed in the final EIR.

Similarly, dissolved oxygen concerns were not comprehensively analyzed across sections. Section 9.1.5.2 of the final EIR, entitled “Dissolved Oxygen” only refers to low oxygen in wetlands (p. 9-13) and not other waterbodies. Further, the section on Organic Carbon (Section 9.1.5.6) does not discuss impacts on dissolved oxygen. For harmful algal blooms (HABs), our comment on Cyanobacteria and brackish water was addressed but HAB effects on biota and humans through pathways other than drinking water was not.

Effects on terrestrial biological resources have high uncertainty due to missing information about mitigation plans and cumulative effects

The Compensatory Mitigation Plan still does not reflect the reality that restoration is not an exact science. While the restoration goal may be to establish environmental conditions favorable to target species, the reality is that it may or may not occur in a reasonable time frame (~5 to 8 years, if ever) and it often requires remedial actions and maintenance for many years thereafter at considerable costs. For example, our comments that the uncertainty of vernal pool restoration and the potential for long term lags in performance were not well described nor reflected in monitoring plans. In support of our concern, Sueltenfuss and Cooper (2019) found that vernal pools only achieved hydrological similarity to reference pools after 9 years, indicating that the length of monitoring should be based on ecosystem status relative to meaningful targets, rather than set time frames.

Criteria used to assess wetland mitigation performance remain weak. While vegetation is commonly used as a criterion for evaluating the ecosystem function of mitigated wetlands, it has been recognized for over three decades that it is not often the best indicator of ecological function (Reinartz and Warne 1993). Flood storage and water quality improvement are two key wetland functions but, in the past, have been required to be replaced in <10% of California wetland mitigation permits (Turner et al. 2001). Additionally, multiple criteria should be used to determine success and suitability. For instance, California coastal wetlands require a combination of soil, nutrient, and vegetation metrics to predict if a mitigated site would be (or not) suitable for clapper rail nesting (Zedler and Callaway 1999).

Our concern about the Compensatory Mitigation Plan being vague has not been fully addressed. It is not clear if the models used to establish the Compensatory Mitigation Plan for individual species considered home ranges (as opposed to species ranges) or if genetically viable population sizes could be maintained at the new restoration sites (Bouldin Island and I-5 ponds) for species of interest. These are important issues for long-term viability and should be addressed in the Compensatory Mitigation Plan. A related concern is that the analysis of project effects on special-status plant and wildlife species considers the direct effects of project construction, but little quantitative consideration is given to indirect effects. For example, the final EIR notes permanent changes to topography, subsurface hydrology, or the amount of impervious surface within 250 feet of habitat of special-status vernal pool aquatic invertebrates that could result in changes to the hydroperiod of that habitat and thus its ability to support special-status vernal pool aquatic invertebrates (lines 23-27 on page13-57). Overall, it is difficult to determine the true effectiveness of the proposed CMP.

Our comments about the weakness of the cumulative impacts were also incompletely addressed. Cumulative impacts are discussed qualitatively but a thorough cumulative effects assessment (CEA) would quantify potential synergistic or antagonistic interactions between the proposed alternatives and the terrestrial landscape. Existing CEA methods are suitable for complex projects with varying degrees of qualitative and quantitative data such as species-stressor models (Hodgson and Halpern 2019), network analysis (Harker et al. 2021), and scenario-building (Mahon and Pelech 2021). It is not clear why these methods or any number of frameworks available to structure a more thorough CEA (e.g., Stelzenmüller et al. 2020, Sutherland et al. 2022) were not used.

Report presentation remains difficult to use

The large number of effects analyzed in the EIR, combined with multiple alternatives and multiple life stages and species, makes the results challenging to interpret, especially when cumulative effects (over multiple impacts and life stages) are discussed. The addition of graphical presentations of the results as a tool for integration would improve interpretability. Saying that the document cannot be made clearer in presenting results is contradicted by the work of Sunding and Browne (2024) who clearly present risks and tradeoffs in the Cost-Benefit Analysis for the Delta Conveyance Project.

Clearly presenting tradeoffs among the species’ responses to alternatives and identifying whether tradeoffs (or win-win situations) differ across alternatives would clarify impacts. Tradeoffs among the species’ responses to alternatives and whether they differ across alternatives would improve decision support. This comment on presentation of the results also appears in the DSP peer review of the Draft Effects Analysis for the EIS/BA as Comments 1 and 10.

References

Brooks, M.L., E. Fleishman, L. Brown, P. Lehman, I. Werner, M.L. Johnson, N. Scholz, C. Mitchelmore, A. Parker, D. Stoms, J. Drever, D. Dugdale, D. Schlenk, S. Teh, S. van Drunick (2011). Life Histories, Salinity Zones, and Sublethal Contributions of Contaminants to Pelagic Fish Declines Illustrated with a Case Study of San Francisco Estuary, California, USA. Estuaries and Coasts 35:603–621.

DeLorenzo, M.E. Impacts of climate change on the ecotoxicology of chemical contaminants in estuarine organisms. *Current Zoology* 61 (4): 641–652.

Diaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R.T., Molnár, Z., Hill, R., Chan, K.M.A., Baste, I.A., Brauman, K.A., Polasky, S., Church, A., Lonsdale, M., Larigauderie, A., Leadley, P.W., van Oudenhoven, A.P.E., van der Plaat, F., Schröter, M., Lavorel, S., Aumeeruddy-Thomas, Y., Bukvareva, E., Davies, K., Demissew, S., Erpul, G., Failler, P., Guerra, C.A., Hewitt, C.L., Keune, H., Lindley, S., Shirayama, Y., 2018. Assessing nature's contributions to people. Science 359: 270–272.

Harker K.J., Arnold L., Sutherland I.J., and Gergel S.E. 2021. Perspectives from landscape ecology can improve environmental impact assessment. FACETS 6: 358–378.

Hodgson, E.E., and Halpern, B.S. 2019. "Investigating Cumulative Effects across Ecological Scales." Conservation Biology 33 (1): 22–32.

Keyl, F., and Wolff, M. 2008. "Environmental variability and fisheries: what can models do?" Reviews in Fish Biology and Fisheries 18: 273-299.

Kotamaki, N., Arhonditsis, G., Hjerppe, T., Hyytiainen, K., Malve, O., Ovaskainen, O., Paloniitty, T., Simila, J., Soininen, N., Weigell, B., and Heiskanen, A. 2024. Strategies for integrating scientific evidence in water policy and law in the face of uncertainty. The Science of the Total Environment 931(5):172855 DOI: 10.1016/j.scitotenv.2024.172855

Reinartz, J.A. and Warne, E.L. 1993. "Development of vegetation in small created wetlands in southeast Wisconsin." Wetlands 13: 153–164.

Rose, K., Jager, H., Monsen, N., Bai, Z., and Howe, E. April 2024. "Peer Review of the Fish and Aquatic Effects Analysis for the Long-Term Operations of the Central Valley Project and State Water Project." A report to the Delta Science Program.

Stelzenmüller, V., Coll, M., Cormier, R., Mazaris, A.D., Pascual, M., Loiseau, C., Claudet, J. et al. 2020. "Operationalizing Risk-Based Cumulative Effect Assessments in the Marine Environment." Science of The Total Environment 724 (July): 138118.

Sueltenfuss, J.P. and Cooper, D.J. 2019. "A new approach for hydrologic performance standards in wetland mitigation." Journal of Environmental Management 231: 1154–1163.

Sunding, D., and O. Browne. 2024. Benefit-cost analysis of the Delta Conveyance Project. Berkely Research Group.

Sutherland, G.D., Smith, J., Waterhouse, F.L., Saunders, S.C., and Paige, K. 2022. "A Pragmatic Approach for Developing Landbase Cumulative Effects Assessments with Aggregated Impacts Crossing Multiple Ecological Values." Environmental Management 69 (5): 1020–34.

Turner, E.R., Redmond, A.M., and Zedler, J.B. 2008. "Count it up by acre or function-mitigation adds up to net loss of wetlands." National Wetlands Newsletter 23(6).

Tyler, A.V. 1992. "A context for recruitment correlations: why marine fisheries biologists should still look for them." Fisheries Oceanography 1: 97–107.

Wiens, J.A., Zedler, J.B., Resh, V.H. Collier, T.K., Brandt, S., Norgaard, R.B., Lund, J.R., Atwater, B., Canuel, E., and Fernando, H.J. 2017. Facilitating Adaptive Management in California's Sacramento–San Joaquin Delta. San Francisco Estuary and Watershed Science 15(2)3.