JASON R. FLANDERS, SBN 238007
Email: jrf@atalawgroup.com
ERICA A. MAHARG, SBN 279396
Email: eam@atalawgroup.com
HARRISON M. BECK, SBN 341717
Email: hmb@atalawgroup.com
AQUA TERRA AERIS LAW GROUP

Attorneys for Friends of the River

JOHN BUSE, SBN 163156
Email: jbuse@biologicaldiversity.org
CENTER FOR BIOLOGICAL DIVERSITY

E. ROBERT WRIGHT, SBN 51861
Email: bwrightatty@gmail.com
SIERRA CLUB CALIFORNIA

Attorneys for Sierra Club California, Center for Biological Diversity, Friends of the River, North Coast Rivers Alliance, Planning and Conservation League, and Save California Salmon

THE STATE OF CALIFORNIA

BEFORE THE STATE WATER RESOURCES CONTROL BOARD

ADMINISTRATIVE HEARINGS OFFICE

IN THE MATTER OF: CALIFORNIA DEPARTMENT OF WATER RESOURCES' PETITIONS FOR CHANGE OF WATER RIGHTS PERMITS 16478, 16479, 16481, AND 16482	**Expert Testimony of Christina Swanson** Date: July 11, 2025

Delta Conveyance Testimony

1. My name is Christina Swanson. I am providing this testimony as an expert on climate change and California water and fisheries issues, and on behalf of Friends of the River and the Center for Biological Diversity to oppose the California Department of Water Resources'

(DWR) application to add two new points of diversion for export of Sacramento River water via the Delta Conveyance Project (DCP).

2. I am an environmental scientist with decades of experience in California's water, fisheries, and climate change science and policy. This includes: fourteen years as a full-time or part-time post-doctoral researcher at the University of California, Davis, where I co-led the research on Chinook salmon and Delta smelt that contributed to the development of the current regulatory standards for fish screens in California; eleven years with The Bay Institute, serving as Fisheries Scientist, Senior Scientist, and finally Executive Director; and eleven years with the Natural Resources Defense Council serving as Director of the organization's Science Center and Senior Scientist for Science and Policy. At various times since 2003 and most recently with the San Francisco Estuary Partnership, I have also worked on projects to develop and report quantitative indicators for the ecological health of the San Francisco Estuary, including tracking status and trends in freshwater inflow, low salinity open water habitat conditions, and fish community condition. I currently serve as Senior Scientist for Policy and Private Sector Partnerships with Project Drawdown, an environmental NGO that works to develop and advance science-based solutions to mitigate climate change. My Curriculum Vitae is included as FOR-101.

Purpose of Testimony

3. The purpose of my testimony is to examine and evaluate DWR's request to add two new points of water diversion on the lower Sacramento River for the DCP in relation to two issues: (1) the effects of those new water diversions and fish screens on resident and migratory fishes and on their lower river and estuarine habitat; and (2) the relationship of DCP operations, water supply performance, and environmental impacts with the likely effects of climate change.

4. The effects of the DCP's new water diversions are important because these facilities and their operations will be an additional, known adverse impact on the Sacramento-San Joaquin Delta and its fish resources. The ecological health of the Delta and the San Francisco Estuary is already poor and, for many environmental variables, continues to decline.[1] Many of the species that will be exposed to the project's facilities and operations are already at imminent risk of extinction, listed under federal and/or state Endangered Species Acts, and/or have already experienced substantial population declines.

5. The relationship of the DCP with climate change is important because the DCP is described and advertised as a climate resilience project intended to help the State of California adapt to "a hotter, drier future"[2] by stabilizing and increasing water supplies for State Water Project (SWP) contractors. Since the DCP would not begin operations until 2045 if it is approved, and since it is planned to operate for many decades after that, understanding the potential range of long term effects that climate change could have on its operations and water supply performance, and of the effects of those operations on the fish and wildlife beneficial uses of the Sacramento River Basin and San Francisco Estuary, is necessary to determine whether the project is in the public interest.

6. For my assessment, I reviewed selected sections of the Final EIR for the DCP (FEIR) and various other supporting documents and background information on the DCP, fish screens, and climate change effects in California and on California water resource management. I organized my assessment around two broad questions.

---

[1] See the 2015 and 2019 State of the Estuary reports published by the San Francisco Estuary Partnership. Available at: SOTER_2.pdf (FOR-101) and State-of-the-Estuary-Report-2019.pdf (FOR-102).

[2] California Natural Resources Agency. August 2022. California's Water Supply Strategy: Adapting to a Hotter, Drier Future. Available at: California's Water Supply Strategy Aug 2022 (FOR-103)

1. Has DWR conducted a credible and reasonable analysis of the DCP's function, operations, and environmental impacts under future conditions?
2. Will the DCP's operations significantly and adversely affect fish, wildlife, or other beneficial public trust uses of the Sacramento-San Joaquin Delta and San Francisco Estuary?

Conclusions

7. Based on my review, it is my expert opinion that DWR's analysis of the future performance and impacts of the DCP is incomplete in some respects and deeply flawed in others. Because of these fundamental problems, it appears unlikely that the project will operate or perform as DWR expects and predicts. Furthermore, based on my review and expertise, it appears that DWR's current analysis overestimates the project's water supply performance and underestimates its environmental impacts. This is true for both issues, the new screened water diversions and the effects of climate change, that I evaluated for this testimony.

8. **Questions 1 and 2 for new diversions and fish screens**: DWR's FEIR analysis of the effectiveness and impacts of its proposed new water diversions and fish screens is limited to reviews and extrapolations of research using other screen types and focused almost entirely on one fish species that will be impacted by the water intake facility, Chinook salmon. DWR's analysis excludes consideration of relevant reports on other species vulnerable to exposure and harm from the DCP, including Delta smelt, steelhead, white sturgeon, and green sturgeon. To address this serious shortcoming, DWR proposes to conduct studies to measure the impacts of the diversions after the DCP is constructed and operational 20 years from now. This is neither a credible nor reasonable approach for an environmental impact analysis for a proposed new facility of this scale that will harm multiple at-risk species. Therefore, the answer to Question 1 is "No," DWR has not conducted a credible and reasonable analysis of the DCP's function, operations, and environmental impacts under future conditions.

9. Despite these analytical limitations, the FEIR clearly demonstrates that the presence and operations of the new water diversions on the Sacramento River will harm fishes and reduce their survival. I further conclude that this harm to these beneficial uses is significant based on four aggravating factors: (1) the current at-risk status of the affected species; (2) the current degraded and deteriorating state of flow and open water habitat conditions in the lower river and estuarine ecosystems; (3) the high degree of uncertainty surrounding DWR's proposed mitigation; and (4) the uncertain functional necessity and water supply benefits of the proposed new diversion facilities. Therefore, the answer to Question 2 is "Yes," the DCP's operations will very likely significantly and adversely affect fish, wildlife, or other beneficial public trust uses of the Sacramento-San Joaquin Delta and San Francisco Estuary.

10. **Questions 1 and 2 for climate change effects**: DWR's analysis of the effects of climate change on operations, water supply performance, and environmental impacts of the DCP has multiple flaws, including: (1) use of an inappropriate hydrological baseline; (2) use of a climate scenario that, in contrast to the State's rationale for the project as an adaptation to a "hotter, drier future," assumes wetter future conditions; (3) insufficient sensitivity analysis to explore effects of alternative future climate conditions; (4) failure to assess future climate change effects on the project for the decades after it becomes operational; and (5) failure to propose measures to adapt to and mitigate the effects of climate change and of climate change related impacts on fish and estuarine habitat beneficial uses, particularly during drought conditions. For these reasons, DWR's analysis of the effects of climate change on the DCP is neither credible nor reasonable. Therefore, the answer to Question 1 is "No," DWR has not conducted a credible and reasonable analysis of the DCP's function, operations, and environmental impacts under future climate conditions.

11. Separately and collectively, these flaws and biases in DWR's climate change analyses lead me to conclude that the FEIR has overestimated the water supply benefits and underestimated the environmental impacts of the DCP. Therefore, the answer to Question 2 is "Yes," in relation to climate change, the DCP's operations will significantly and adversely affect fish, wildlife, and related beneficial public trust uses of the Sacramento-San Joaquin Delta and San Francisco Estuary.

12. In the following sections, I provide further explanation for my conclusions.

Fish Screens Planned for the New DCP Water Diversions

13. DWR proposes to build two new 3,000 cubic feet per second capacity water intake facilities, or water diversions, on the lower Sacramento River near the town of Hood. Each diversion will be equipped with a series of 8-foot diameter cylindrical fish screens linked end to end, with a total length of ~900 feet. Each of the two screened diversions will be located on or near outside bends of the river,[3] where the river depth is 17 to 25 feet.[4] The screens will be located in the upper half to upper third of the water column.

14. The planned DCP fish screens are positive barrier screens, meaning that even small fish will not be entrained through the screen into the intake facility and water conveyance tunnel. However, fish that come into the vicinity of the diversions will be exposed to both the physical structures (i.e., walls, fish screens, and supports) and the altered flow conditions resulting from both flow past the structure and from the water being drawn in through the screens.

---

[3] FEIR Mapbook 14-3, Sheet 1 of 8, General Plan Land Use Designations, Bethany Alignment (Alternative 5). Available at: ENV301_EIREIS_11x17_DCOB2B_H_Alt5_Ch14-3_ADA.pdf | Powered by Box (AHO-1126)
[4] FEIR, Table 12-13, page 12-77. (AHO-1099)

15. Current fish screen standards[5] require a maximum of 0.2 feet per second approach velocity[6] (i.e., the velocity of water flowing perpendicularly toward and through screen) and a minimum 0.4 feet per second sweeping velocity (i.e., the velocity of the water passing parallel to the screen surface). The sweeping velocity flow is intended to facilitate moving the fish past the screen before it can be drawn into the screen by the approach velocity flow. For the DCP fish screens, the sweeping flow is controlled by river flow conditions rather than fish screen design or managed operations. In addition to the flow criteria, fish screens are generally designed to ensure that fish are directly exposed to the screen for no longer than 60 seconds.[7] If, based on fish size, behavior, screen length, or sweeping velocities, the likely exposure duration is longer than this, one or more bypass structures that collect the fish and safely transport them back into the river away from the screen are usually required.

Impacts of DCP Diversions and Fish Screens on Fishes

16. Based on my knowledge of fish behavior and performance in artificial flow regimes near fish screens, there are several ways that the new intake facilities and fish screen facilities planned by DWR for the DCP will cause harm to resident and migratory fish species.

17. First, the intakes and fish screen facilities are located on or near outside bends of the Sacramento River and the fish screens are located close to the riverbank. These are the

---

[5] Fish Screening Criteria for Anadromous Salmonids, National Marine Fisheries Service Southwest Region, January 1997. Available at: Fish Screening Criteria for Anadromous Salmonids (FOR-104)

[6] This approach velocity criterion applies to waters where Delta smelt may be present

[7] In California, this exposure duration applies to fish screens on canals. However, the NMFS criteria also state that: "Large stream-side installations may require intermediate bypasses along the screen face to prevent excessive exposure time." Page 3 of Fish Screening Criteria for Anadromous Salmonids, National Marine Fisheries Service, Southwest Region, January 1997. (FOR-106)

locations in the river where downstream migrating fish tend to be most abundant.[8] Therefore, the DCP's diversion design locations will, in essence, maximize the proportion of fish, like juvenile Chinook salmon, steelhead, white sturgeon, and green sturgeon, in the reach of the river near the intakes that are directly exposed to the diversions and fish screen facilities. In the DCP's FEIR, DWR predicts that "exposure of juvenile migrating winter-run Chinook salmon to the screens could be frequent."[9]

18. Second, the fish screens are very large relative to the river channel, with the horizontally oriented cylindrical screens occluding more than one third to one half of the water column at their locations. The diversions will also have a large hydraulic influence on the open water riverine habitat in the vicinity of the intakes when water is being diverted through the screen. For example, for a Sacramento River flow of 18,000 cfs and a moderate diversion rate (e.g., 2000 cfs), the hydraulic influence of the intake would extend 17-22% of the river width while diverting 11-12.5% of the river's flow.[10] Given the large diameter and long length of the intake screens, the relatively low sweeping velocities and resultant long predicted screen passage durations (see below for more detail on this), and large hydraulic footprint of the intake during diversion operations, the likelihood of the new diversions intercepting high percentages of migrating fish during water diversion operations is high.

19. Third, as described and analyzed, the DCP plans to preferentially and maximally divert water during periods of high Sacramento River flows. This seasonal period and these flow conditions coincide with both the timing and environmental conditions that trigger downstream migration of juvenile anadromous fishes, including Chinook salmon, steelhead,

---

[8] DCA (Delta Construction Authority) 2020. Analysis of River Bends and Fish Migration. Available at: Microsoft Word - Analysis of River Bends and Fish Migration (formerly SEC Comment Responses A-1) (FOR-105)
[9] FEIR, Chapter 12, page 12-77, line 13-14. (AHO-1099)
[10] FEIR, Table 12-17, pages 12-81-82. (AHO-1099)

white sturgeon, and green sturgeon. Therefore, the DCP's planned operations will also, in essence, maximize the proportions of migrating juveniles of all these species that are directly exposed to the intakes and fish screens.

20. Fourth, the planned fish screens are unlike any fish screen facility that I am aware of. They differ from the typical cylindrical T-shaped fish screens, which have been used effectively on the Columbia River,[11] in that they are approximately 30 times longer (i.e., the Columbia River screens are ~30 feet long as compared to the DCP's proposed ~900 feet long screens). The DCP's proposed fish screen design also differs from long, flat plate fish screens, such as the Glenn-Colusa fish screen,[12] in that it does not include any intermediate bypasses that would facilitate an entrained fish to be diverted away from the screen and water diversion. According to the DCP FEIR, under low river flows and resultant low sweeping velocity conditions of 0.4 feet per second, fish could be exposed to the water diversion and fish screen for more than 90 to 120 minutes,[13] far longer than the recommended 60 second exposure duration. Furthermore, that exposure could occur with the fish trapped between the cylindrical fish screens and the riverbank wall of the diversion facility.

21. Fifth, predatory fish like striped bass are attracted to and tend to congregate near structures and areas of altered flow conditions. The DCP diversion facilities will, in my judgement, likely attract predatory fishes. Thus, in addition to possible injury and stress from prolonged exposure and/or physical contact with the screen and water intake structure, entrained fish will be at higher and potentially prolonged risk of predation.

---

[11] Coutant, Charles C. "Why cylindrical screens in the Columbia River (USA) entrain few fish." *Journal of Ecohydraulics* 9, no. 1 (2024): 43-54. Available at: Why cylindrical screens in the Columbia River (USA) entrain few fish (FOR-106)

[12] Vogel, D. Biological evaluations of the fish screens at the Glenn-Colusa Irrigation District's Sacramento River pump station, 2002-2007. Available at: Microsoft Word - Final GCID Fish Screen Report.doc (FOR-109)

[13] FEIR, Table 12-23, page 12-91. (AHO-1099)

22. Finally, most of the native fish species that will be exposed to the DCP diversions and fish screens, including all four runs of Chinook salmon, steelhead, white sturgeon, green sturgeon, and Delta smelt, are already in severe decline and/or at imminent risk of extinction. For migratory species like Chinook salmon, their survival through the Delta is already low due to poor environmental conditions, reduced flow, entrainment into the central Delta and south Delta water diversion facilities, and predation. Yet, according to the FEIR, projected operations of the new diversions on the Sacramento River will further reduce through-Delta survival of juvenile Chinook salmon by as much as 10%.[14]

23. Based on all these factors, there is no question that the addition of two new, large water diversion structures in close proximity to each other and within preferred habitat and migratory pathways for these fish species will cause significant direct harm to these fishes, and will further degrade both the local habitat and, because of diversion induced flow reductions, downstream habitat conditions.

DWR's Analysis of DCP Diversion and Fish Screen Impacts is Inadequate

24. DWR's FEIR analysis of the impacts of the DCP diversions and fish screens on fish and aquatic resources is inadequate, incomplete, and likely underestimates the harmful impacts of the addition of two new water diversions on the Sacramento River for at least two reasons.

25. First, DWR's FEIR analysis of impingement, screen contact, and passage at the proposed intake facilities was limited to a literature review and extrapolation of research results for

[14] FEIR, Table 4B-4, pages 4B-10 through 4B-12. (AHO-1025)

Chinook salmon.[15] It excludes consideration of relevant studies and reports on other species vulnerable to exposure and harm, including Delta smelt, steelhead, white sturgeon, and green sturgeon. These species will also be affected by the DCP's diversions and, in the case of Delta smelt, white sturgeon, and green sturgeon, are known to respond to screened water diversions and perform differently than salmonid species. For example, research with Delta smelt showed that this species experienced frequent injurious contact with an experimental fish screen and that post-exposure mortality was a function of the frequency and severity of screen contact.[16] In other studies, juvenile green sturgeon exposed to a fish screen experienced more frequent screen contact than juvenile white sturgeon, with nearly 17% of the exposed green sturgeon contacting the screen at least once.[17]

26. Second, the proposed fish screen design is novel and, to my knowledge, has never been tested with any fish species. Therefore, its efficacy for protecting resident and migratory fishes from the physical structure and/or operations of the new water diversions is unknown. DWR's FEIR acknowledges that their planned fish screen design is untested. Instead, they propose that, after the project is constructed and operational (presumably in 2045), they will conduct studies to measure its effectiveness and impacts on selected fish species and use those results to "inform the refinement of future operations and adaptive management."[18]

---

[15] FEIR Table 12-3, page 12-43. Delta smelt are listed in this table entry, but there is no discussion of research results for this species with regard to impingement, screen contact, or passage. (AHO-1099)

[16] Swanson, C., Young, P.S., and Cech, J.J. 2005. Close encounters with a fish screen: integrating physiological and behavioral results to protect endangered species in exploited ecosystems. Trans. Am. Fish. Soc. 134: 1111–1123. doi:10.1577/T04-121.1. (FOR-108)

[17] Poletto, Jamilynn B., Dennis E. Cocherell, Natalie Ho, Joseph J. Cech Jr, and A. Peter Klimley. "Juvenile Green Sturgeon (Acipenser medirostris) and White Sturgeon (Acipenser transmontanus) Behavior Near Water-Diversion Fish Screens: Experiments in a Laboratory Swimming Fume." Available at: Juvenile Green Sturgeon (Acipenser medirostris) and White Sturgeon (Acipenser transmontanus) Behavior Near Water-Diversion Fish Screens: Experiments in a Laboratory Swimming Fume (FOR-109)

[18] FEIR, Page 12-97. (AHO-1099)

27. Single species assessments are not sufficient, and the promise of future studies is not a credible substitute for a complete and appropriately conservative analytical and interpretive approach to assess the potential environmental impacts of two large, new water diversion facilities in an already degraded system with at-risk native species. At a minimum, DWR should review the scientific and grey literature studies on the responses to fish screens by other species, such as Delta smelt, white sturgeon, and green sturgeon, and apply similar analyses, such as potential screen exposure durations or evaluations of screen contact injuries, that they used for Chinook salmon. Based on my understanding of the literature and my experience conducting some of this research on some of these other species, other species are much more vulnerable to fish screen-related stress, injury, and loss of orientation than Chinook salmon.

28. The limited mitigation measures that DWR has identified to reduce adverse impacts of the new water diversions are uncertain with regard to both their efficacy and whether they will be implemented. For example, installation of a positive barrier fish screen on the diversion intakes will prevent fish from being removed from the ecosystem with the water but, as described above, DRW has provided little credible evidence that the structural and hydraulic footprint of the facilities will not harm exposed fishes. Water diversion operations may be reduced or curtailed under low Sacramento River flow conditions, but the large size of the facility, low sweeping flow requirements, and lack of fish bypasses will result in fish being directly exposed to the intake facilities for extended periods of time. DWR's reliance on future studies and adaptive management to reduce diversion and fish screen impacts on fishes is similarly uncertain and, therefore, insufficient to support a conclusion that the harmful impacts of the DCP's new water diversions can or will be mitigated.

29. In my judgement, DWR's FEIR almost certainly underestimates the harm of the proposed new water diversions and fish screens to resident and migratory fishes. Therefore, and

because of the insufficiencies of the DWR's analyses, it cannot be concluded that the project will not unreasonably harm these fish and wildlife beneficial uses.

Effects of Climate Change on the Sacramento Basin and Delta

30. Climate change will manifest in the Sacramento River Basin and the Sacramento-San Joaquin Delta, from which the DCP proposes to divert water, in multiple ways. These include increased air temperatures; increased evapotranspiration; reduced snowpack; more variable and extreme precipitation; more variable runoff and stream flows; increased water temperatures; and more frequent, severe, and prolonged droughts.[19] In addition, in the lower reach of the Sacramento River and the Delta, sea level rise will push saltwater from the San Francisco Bay inland, shifting the low salinity zone upstream. Relative to water management operations, sea level rise will require that more fresh water from the watershed's rivers be allowed to flow through and out of the Delta to preserve water quality for Delta water diversions.

31. All these projected climate change effects are already happening. In several long-term datasets (e.g., temperature, water year type, drought severity), the effects of climate change are detectable starting in the 1980s.[20] California has been a global leader in recognizing, mitigating, and planning for adaptation and resilience to climate change. The California Environmental Protection Agency's *Indicators of Climate Change in California* report provides detailed quantitative descriptions of recent trends for many of these variables.[21] The

---

[19] Houlton, Benjamin, Jay Lund. (University of California, Davis). 2018. Sacramento Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-002. Available at: Sacramento Valley Region Report (ca.gov) (FOR-110)

[20] See FOR Exhibit-111. Figure A. Changes in average annual temperature in California, and FOR Exhibit 112. Figure B. Changes in the Palmer Drought Severity Index in California.

[21] Office of Environmental Health Hazard Assessment, California Environmental Protection Agency (2018). Indicators of Climate Change in California. Available at: 2018caindicatorsreportmay2018.pdf (FOR-113)

State has also developed a comprehensive water supply strategy to adapt to a "hotter, drier future."[22] The DCP is included in that strategy. There is no doubt that this project, should it be built, will be operating under progressively worsening climate change effects.

DWR's Analysis of DCP of Climate Change on Operations and Impacts is Inadequate

32. DWR's FEIR analysis for the DCP acknowledges that the ongoing and future effects of climate change will affect the project's operations, environmental impacts, and water supply performance. The DCP is, after all, not planned to begin operations until 2045, 20 years from now, and it is expected to continue operating for 100 years after that.[23] However, the FEIR's analyses of the effects of climate change on DCP operations, performance, and impacts are both woefully inadequate and deeply flawed for multiple reasons.

33. First, for all of its modeling of future conditions, the DCP's FEIR uses an inappropriate, outdated, and unadjusted hydrological baseline, the CalSim 3 monthly hydrological dataset for 1922-2015, as the hydrological time series upon which it applies climate model generated perturbations in surface runoff, baseflow, surface water evaporation, and potential evapotranspiration.[24] Because the effects of climate change on California's hydrology, and in particular the increased frequency and intensity of droughts, have been detectable since the last 30-40 years, this near century-long hydrological series is no longer an accurate representation of current, much less future, inter-annual variation in California's cycles of

---

[22] California Natural Resources Agency. August 2022. California's Water Supply Strategy: Adapting to a Hotter, Drier Future. Available at: California's Water Supply Strategy Aug 2022 (FOR-103)

[23] Sunding, David and Oliver Browne. May 16, 2024. Benefit-Cost Analysis of the Delta Conveyance Project. Available at: Benefit-Cost Analysis of the Delta Conveyance Project (FOR-114)

[24] Department of Water Resources, Technical Memorandum, December 7, 2023. CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis. Page 1-9, "Surface runoff and baseflow were used to produce total runoff at all locations that correspond to CalSim 3 rim inflows and unimpaired flow. Potential ET was used to estimate crop ET throughout the Sacramento and San Joaquin Valleys. Surface water evaporation was used to estimate evaporation rates at reservoirs within the CalSim 3 model domain." Available at: CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis, (FOR-115)

wet and dry years. For example, a review of the California Data Exchange Center's Water Year Type Dataset for the Sacramento Basin shows that the frequency of dry and critically dry water year types has increased by almost 50%, from 33% of years for the 1922-1979 period to 47% of years for the 1980-2015 period.[25] This unadjusted historical hydrology sequence also includes a four decade long period (1936-1975) dominated by mostly wet conditions and no droughts. Based on our current scientific understanding of climate change impacts in California, multi-decade wet hydrological conditions such as these are extremely unlikely in the future. The FEIR's use of an outdated hydrological sequence that is almost certainly unrepresentative of future conditions is, in my judgement, a serious analytical error. The result of this error is that DWR's analyses for the DCP are biased toward the assumption that the hydrological conditions in which the DCP will be operating will be wetter, with fewer multi-year droughts, than they have been for the past few decades. The effect of this bias is that the FEIR analyses overestimate the water supply benefits and underestimate the environmental impacts of the DCP.

34. Second, for its comparison of the DCP Preferred Alternative (Alternative 5) to the No Project Alternative, the FEIR applies a near-term future climate adjustment, the 2040 Central Tendency (CT) scenario.[26] This climate scenario is also biased toward an assumption that future conditions will be wetter and runoff will be higher than today, despite DWR's rationale for the DCP that climate change is leading to a hotter, drier future. It is appropriate that DWR has applied climate change adjustments to their FEIR modeling of their Preferred

---

[25] California Data Exchange Center, Water Year Type Dataset; available at: CDEC Water Year Type Dataset - Dataset - California Natural Resources Agency Open Data. Accessed June 22, 2025. (FOR-116)

[26] The climate change scenario centered around 2040 (2026-2055), was developed with 20 Coupled Model Intercomparison Project 58 (CMIP5) global climate projections, selected by the California Department of Water Resources (DWR) Climate Change Technical Advisory Group (CCTAG). See FEIR Appendix 5A, Section B, page B-1. The central tendency is stated as the statistical measure that represents the single value of the entire distribution or a dataset. The central tendency is a metric derived from the mean, median, and mode of the results of selected subset of downscaled climate models.

Alternative to account for the fact that climate change has been occurring for decades, and that the DCP will not begin operations until 2045. However, in contrast to more comprehensive assessments of the effects of climate change on future precipitation in California that yield mixed and ambiguous results (i.e., some climate models predict increases and others decreases[27]), the 2040 CT model predicts that the Sacramento and Feather River Basins will see substantially higher precipitation and higher runoff in the near future. The 2040 CT scenario is also sharply different from 2040 Median scenario, which was developed from a different ensemble of climate models and which projects that future runoff will be lower.[28] By using the 2040 CT climate scenario, DWR's analysis for the DCP presumes that the hydrological conditions in which the DCP will be operating will be wetter than they are now and have been for the past few decades. In my view, this is not a reasonable assumption and the effect of this additional bias in the FEIR analyses is to overestimate the water supply benefits and to underestimate the environmental impacts of the DCP.

35. Third, the very limited sensitivity analysis presented in the FEIR clearly shows that the DCP's initial operations in 2045 will be substantially affected by different climate change assumptions and that, under conditions less favorable (i.e., less wet) than the 2040 CT scenario, the project's water supply performance and environmental impacts worsen.[29] The FEIR compares its preferred Alternative 5 with the No Project Alternative using the FEIR's

---

[27] He, Minxue, Andrew Schwarz, Elissa Lynn, Michael Anderson (California Department of Water Resources). 2018. Projected Changes in Precipitation, Temperature, and Drought across California's Hydrologic Regions. California's Fourth Climate Change Assessment. Publication number: CCCA4-EXT-2018-002. Available at: 07354626677.pdf (noaa.gov) (FOR-117); and California Department of Water Resources. Calsim 3 Results for 2070 climate change and sea level projections and sensitivity analysis, December 7, 2023. Available at: DWR_DCP_2023_2070Memo_December.pdf (ca.gov). (FOR-115)

[28] FEIR, Appendix 30A, Figure 30A-2 for 2040 CT, page 30A-5, and Figure 30A-3 for 2040 Median, page 30A-4. (AHO-1198)

[29] FEIR, Chapter 30. (AHO-1198)

principal 2040 CT scenario (with 1.8 feet sea level rise), another 2040 CT scenario with 0.5 feet sea level rise, and with the 2040 Median scenario (with 1.8 feet sea level rise). The results show that under the drier conditions projected by the 2040 Median scenario, total Delta exports are higher during the ecologically important winter and spring,[30] but lower overall.[31] Under the 2040 Median scenario, winter-spring environmental conditions that are already poor for resident and migratory fishes are worsened. These include: (1) lower Sacramento River flows downstream of the new diversion facilities,[32] (2) lower Delta outflow,[33] and (3) more upstream X2 location.[34]

36. Fourth, even though DWR assumes that the DCP will operate for at least 100 years after construction, the FEIR does not include any meaningful analysis of how the effects of climate change after 2040 could affect the project's operations or impacts during its operational lifetime. Climate change will not stop in 2040. Instead, it is highly likely that its effects on hydrology and sea level rise in the Sacramento River Basin and Sacramento-Joaquin Delta will worsen. Climate scenarios for future conditions in 2070 have been developed by DWR and used for operational and environmental assessments of the DCP,[35] benefit-cost analyses for the DCP,[36] and water availability analyses for another proposed long-lived water infrastructure project, the Sites Reservoir Project.[37] This 2070 climate scenario has also been modified to reflect variations in climate extremes, including "dry,

---

[30] FEIR, Chapter 30A, Figure 30A-26, page 30A-20. (AHO-1198)
[31] FEIR, Appendix 30A, Figure 30A-27, page 30A-20. (AHO-1198)
[32] FEIR, Chapter 30A, Figure 30A-22, page 30A-18. (AHO-1198)
[33] FEIR, Chapter 30A, Figure 30A-23, page 30A-18. (AHO-1198)
[34] FEIR, Chapter 30A, Figure 30A-24, page 30A-19. (AHO-1198)
[35] Department of Water Resources, Technical Memorandum, December 7, 2023. CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis. Available at: CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis (FOR-115)
[36] Sunding, David and Oliver Browne. May 16, 2024. Benefit-Cost Analysis of the Delta Conveyance Project. Available at: Benefit-Cost Analysis of the Delta Conveyance Project (FOR-114)
[37] 2023 Amended Water Availability Analysis for Sites Reservoir Project (FOR-118).

extreme warming" (DEW) conditions and "wet, moderate warming" (WMW) conditions. However, rather than addressing or even exploring this issue, the DCP FEIR states: "Because of the compounding uncertainties associated with climate change, system operations, water demands, and regulations associated with predicting future conditions, projections beyond 2070 were not conducted because they would be too speculative to provide any meaningful information."[38]

37. In my judgement and professional opinion, this statement and explanation for DWR's decision not to assess and explore the DCP's future operations, performance, and impacts in the context of a range of future climate extremes using available climate scenarios in the FEIR constitutes analytical malpractice. Further, DWR's inability or unwillingness to analyze or report in the FEIR how the DCP might function and operate in the decades after it becomes operational should, in my view, preclude the State Water Resources Control Board from approving DWR's request to add two new water diversions on the Sacramento River.

38. Despite the absence of any assessment of future climate change impacts on DCP function, operations, and impacts in the FEIR, DWR has in fact conducted some of these analyses. The "CalSim 3 Results for 2070" technical memorandum describes numerous modeling studies using the 2070 Median climate scenario (with both 1.8 and 3.5 feet of sea level rise) along with several different operational assumptions, including relaxation of environmental regulatory standards and reduction in irrigated agricultural acreage. According to this memo, baseline CalSim 3 results with the 2070 Median (3.5 feet sea level rise) "showed more frequent occurrence of SWP and CVP reservoirs at dead storage and additional drawdown of groundwater storage compared to existing conditions and 2040 scenarios presented in the

[38] FEIR, Chapter 4, page 4A-2. (AHO-1024)

DCP EIR."[39] Results for most of the 2070 Median model runs also show degradation of winter-spring environmental conditions that are already poor for resident and migratory fishes, including lower Sacramento River flows downstream of the new diversion facilities,[40] lower Delta outflow,[41] and more upstream X2 location.[42]

39. In my view, these 2070 Median climate assessments conducted by DWR but not included in the FEIR also illuminate another serious problem with DWR's assessment of climate change impacts on future DCP function and environmental impacts and its apparent expectations for DCP operations to mitigate them. Several of the model simulations they use for their sensitivity analysis include the assumption that, in the driest 15% of years, environmental protections will be waived.[43] Essentially, DWR's assumption is that, when hydrological conditions are dry, current environmental protections that were largely designed to protect fish, wildlife, and ecosystem beneficial uses during dry conditions, will not be enforced. Unsurprisingly, the results of these model simulations predict degradation of Sacramento River flows, Delta outflow, and X2 location compared to the No Project Alternative. Further, in none of their model simulations and sensitivity analyses does DWR test any conditions

---

[39] Page 1-2, in in Department of Water Resources, Technical Memorandum, December 7, 2023. CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis. Available at: CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis (FOR-115)

[40] Table 13, page 4-11, in Department of Water Resources, Technical Memorandum, December 7, 2023. CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis. Available at: CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis (FOR-115)

[41] Table 14, page 4-13, in Department of Water Resources, Technical Memorandum, December 7, 2023. CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis. Available at: CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis (FOR-115)

[42] Table 15, page 4-14, in Department of Water Resources, Technical Memorandum, December 7, 2023. CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis. Available at: CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis (FOR-115)

[43] Model simulation runs 6np, 9np, 10np, and 11np in Section 3.0, Sensitivity Analysis—No Project, Page 3-1, Department of Water Resources, Technical Memorandum, December 7, 2023. CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis. Available at: CalSim 3 Results for 2070 Climate Change and Sea Level Projections and Sensitivity Analysis (FOR-115)

with improved or more rigorous environmental protections, such as the proposal currently being considered by the SWRCB to require seasonally increased Delta outflows.

Concluding Comments

40. There is no doubt that the effects of climate change on water resources in California will be substantial and, in general, mostly adverse for the environment and water supply. There is no doubt that the State will need to address and adapt to these effects of climate change, both to protect the environment and to protect and make water supplies for urban, industrial, and agricultural use more resilient. There is no doubt that some of these water supply strategies will include building large infrastructure projects, while others will be implemented by individuals and communities. And it is also true that "attempts to modernize our critical water infrastructure" have been difficult and subject to delay for a variety of reasons.[44] But the determination of which strategies will be most effective for what water uses, that is, which strategies are in the public interest, should be based on: (1) credible analyses of the need for the strategy; (2) the likelihood that the strategy will meet the identified need; (3) whether the strategy will have other adverse or unintended consequences or impacts, and (4) whether there exist alternative strategies that can meet the need with more certainty, less cost, and/or less adverse impact. This last issue is also addressed in the DWR's FEIR analysis. According to that analysis, without the DCP (i.e., the No Project Alternative), other water supply strategies, such as desalination, water recycling, groundwater recovery, and water use efficiency, "would foreseeably compensate for the supply decreases associated with climate change" in three of the SWP's four service areas.[45]

---

[44] Statement for California Governor Gavin Newson, May 14, 2025. Governor Newsom's budget calls for fast-track of critical water infrastructure project. Available at: Governor Newsom's budget calls for fast-track of critical water infrastructure project | Governor of California (FOR-119)

[45] FEIR, Chapter 6, Table 6-8, pages 6-46 to 6-47. (AHO-1050)

41. Based on my expertise and my review of DWR's FEIR analysis for its proposed Delta Conveyance Project and other related materials, I have reached two broad conclusions. First, the project will significantly and adversely affect fish and ecosystem beneficial uses. Second, because of their seriously flawed climate change analyses in the DCP FEIR, DWR has not presented a credible analysis and, I would argue, does not have a credible understanding of how well the project will operate compared to their stated objectives for the project, or compared to potential alternative projects to achieve those same objectives. In my expert opinion, if the DCP is approved and constructed, it is very likely that the project will exacerbate the ongoing ecosystem degradation and population declines of native species, and it is unlikely that the project will deliver the water supply benefits it promises. For these reasons, DWR's request to add two new water intakes diversions on the Sacramento River to divert water into the DCP should be rejected.

DATED: July 11, 2025

Christina Swanson