CSPA-2

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BEFORE THE

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

HEARING IN THE MATTER OF CALIFORNIA DEPARTMENT OF WATER RESOURCES AND UNITED STATES BUREAU OF RECLAMATION REQUEST FOR A CHANGE IN POINT OF DIVERSION FOR CALIFORNIA WATER FIX	TESTIMONY OF BILL JENNINGS

I Bill Jennings, do hereby declare:

I. INTRODUCTION

My name is Bill Jennings. I am the Executive Director of the California Sportfishing Protection Alliance (CSPA). I served as CSPA's Chairman from 1987 to 2005, when I became CSPA's Executive Director. Between 1995 and 2005, I served as Deltakeeper, a project of San Francisco Baykeeper. I have more than thirty years experience in water quality, water rights and fishery issues in the Delta and tributary waterways. My responsibilities include reviewing and commenting on water right petitions and changes; CEQA/NEPA documents; WDRs and NPDES permits; and State and Regional Board plans and policies. I also oversee a compliance program that has resulted in more than five hundred enforcement actions against violators of

environmental laws established to protect habitat and water quality. A copy of my statement of qualifications has been submitted as Exhibit CSPA-1.

II. OVERVIEW OF TESTIMONY

My testimony will describe CSPA's riparian water right, how the Department of Water Resources (DWR) and U.S. Bureau of Reclamation (USBR) have not met their burden of proof that California WaterFix (CWF) will not harm or injure legal users of water and how operation of the CWF project will indeed worsen Delta water quality and injure legal users of water.

III. CSPA IS A LEGAL USER OF WATER

CSPA owns 14.53 acres of riparian land in Collinsville California in the western Delta near the junction of the Sacramento and San Joaquin Rivers (see below). CSPA's rights for riparian diversion are senior to those of DWR and USBR (jointly DWR/USBR or Petitioners). In considering how best to utilize our property, CSPA has considered a number of potential projects including, among others: a tidal and upland mitigation bank, demonstration habitat project focused on plants and other species historically present in the area, an educational project for school children highlighting the connection between water and natural communities, a community garden for disadvantaged people, a recreational area including fishing access and an environmentally focused conference center in a setting of restored habitat.

The present degraded quality water adjacent to our land and the prospect of further degradation has delayed our decision on how best to use CSPA's property. CSPA has been patiently waiting for the State Water Resources Control Board (SWRCB) to

complete the long-delayed update to the *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (Bay-Delta Plan) before making a final decision on how to make best use of the property. The proposed North Delta diversion project would reduce outflow and further degrade water quality adjacent to our property and restrict our ability put our property to the best use. The risk and uncertainties of CWF including risks associated with adaptive management and the project's operational flexibility ensures that CSPA is unable to make informed economic decisions on how to best invest in our property. This will inevitably and adversely affect the value of our property. CSPA's members also fish, boat, swim and aesthetically enjoy Delta waterways and associated riparian habitat and further degradation of water quality would injure their legal use of these waters and habitats.

IV. COMPLIANCE WITH WATER RIGHTS DECISION 1641 (D-1641) DOES NOT ESTABLISH LACK OF INJURY

Petitioners DWR and USBR have testified that the State Water Project (SWP) and Central Valley Project (CVP) have largely complied with D-1641 in the past and that modeling demonstrates that CWF operations will be able to comply with D-1641 in the future. However, as Victoria Whitney, then Chief of the SWRCB's Water Rights Division, informed DWR and USBR in 2004, "Significant degradation may occur in the absence of violations of water quality objectives in cases where the degradation impairs a senior water right of water of a usable quality" (See Exhibits CSPA-15 and CSPA-16)

The Bay-Delta standards included in D-1641 only specify flow, chloride, electrical conductivity, dissolved oxygen (Stockton Ship Channel) and narrative standards

protecting species composition and wildlife habitat in Suisun Bay tidal marshes and a doubling of the natural production of Chinook salmon. However, California's Porter-Cologne Water Quality Control Act establishes beneficial uses of the state's waters as not limited to but including domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. Porter-Cologne defines "quality of water" as the chemical, physical, biological, bacteriological, radiological and other properties and characteristics of water, which affect its use. The Central Valley Regional Water Quality Control Board's *Water Quality Control Plan for the Sacramento River Basin and San Joaquin River Basin* (Fourth Edition, Revised April 2016) identifies the surface water beneficial uses of the Delta as municipal and domestic supply, agricultural irrigation and stock watering, industrial process and supply, contact and noncontact recreation, warm and cold freshwater habitat, warm and cold fish migration, warm spawning, wildlife habitat and navigation. (SWRCB-34, p. II-8.00)

Promulgated numerical water quality standards exist for only a small subset of the thousands of chemical constituents that are found in Delta waterways and that have been identified as having potential to adversely impact beneficial uses. Nor do promulgated water quality standards address additive or synergistic effects of interacting chemical constituents or the sublethal impacts of these constituents on beneficial uses. Consequently, any project that increases constituent concentration, the residence time for constituents to interact with the environment or that decreases the dilution or assimilative

capacity of ambient waters has the potential to harm or cause injury to those that legally use the identified beneficial uses of water.

D-1641 was adopted fifteen years ago in 2000 and implemented the water quality standards in the 1995 amended Bay-Delta Plan that was originally adopted in 1978. A subsequent 2006 amendment to the Bay-Delta Plan retained the same water quality standards as the 1995 Plan. Since adoption of the Bay-Delta Plan, virtually all of the pelagic fish species and native lower tropic orders monitored by the California Department of Fish and Wildlife (CDFW) have declined by one to two orders of magnitude. The SWRCB has failed to comply with federal Clean Water Act mandates to update the Bay-Delta Plan every three years. Many of the anadromous fisheries that migrate through Delta waters have experienced similar declines. During the same period, numerous pollutants, including various pesticides, metals/metalloids, other organics, pathogens, nutrients, as well as toxicity and invasive species have been identified as impairing beneficial uses in Delta waters and added to the SWRCB/USEPA 303(d) List of Water Quality Limited Segments. (CSPA-17, pp. 119-121)

Increasing degradation of the Delta's water quality and fisheries led the California Legislature to adopt the 2009 Delta Reform Act. (CSPA-26) The Act established the state goal of achieving "coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem." The Legislature established a Delta Policy to, among other things, "restore the Delta ecosystem, including its fisheries and wildlife, as the heart of a healthy estuary and wetland ecosystem" and "improve water quality to protect human health and the

environment consistent with achieving water quality objectives in the Delta." (CSPA-26, §85020(c) & (e)) It established a state policy to "reduce reliance on the Delta in meeting California's future water supply needs." (*Ibid*. §85021) It found and declared that Delta is a "delicately balanced estuary and wetland ecosystem of hemispheric importance" (*Ibid*. §85022(c)(1)) and "the permanent protection of the Delta's natural and scenic resources is the paramount concern to present and future residents of the state and nation" (*Ibid*. §85022(c)(2)). And it declared, "the longstanding constitutional principle of reasonable use and the public trust doctrine shall be the foundation of state water management policy and are particularly important and applicable to the Delta." (*Ibid*. §85023)

Pursuant to direction in the Delta Reform Act, the SWRCB conducted an extensive public proceeding to determine flow criteria for the Delta necessary to public trust resources, using best available scientific information. The August 2010 SWRCB report, titled *Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem,* found that "the best available science suggests that current flows are insufficient to protect public trust resources" (SWRCB- 25, p.2) and that "recent Delta flows are insufficient to support native Delta fishes for today's habitats" (p. 5). It recommended flow criteria crafted as percentages of unimpaired flows of: "75% of unimpaired Delta outflow from January through June; 75% of unimpaired Sacramento River inflow from November through June; and 60% of unimpaired San Joaquin River inflow from February through June" (p. 5). While the SWRCB deemed these flows as

necessary to protect public trust resources, they have not been subjected to a full public trust balancing with other beneficial uses.

The CDFW, pursuant to the Delta Reform Act, conducted a similar public proceeding to develop quantifiable biological objectives and flow criteria for species of concern dependent on the Delta. In November 2010, following a peer-review process, CDFW issued a report titled *Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta.* The report recommended numerous biological objectives and a flow regime similar to that recommended by the SWRCB. (SWRCB-66, pp. 97-107)

Regardless of what happens in this proceeding, future flows and water quality criteria will inevitably be increased and strengthened over criteria that have proven to be seriously deficient and which have led to significant degradation of water quality and public trust resources. Where pollutants are already identified as impairing beneficial uses, such as electrical conductivity, water quality is already degraded and users of water are already injured. In a highly degraded and impaired ecosystem where beneficial uses and public trust resources have already been identified by state and federal agencies as not being protected, simply maintaining the status quo or complying with existing inadequate requirements cannot be the acceptable standard to demonstrate no injury to legal users of water.

Any incremental increase in constituent concentration, reduction of assimilative capacity or increased residence time for pollutants to interact with the environment in a highly degraded ecosystem, even if such incremental increase would comply with

existing inadequate water quality standards, would cause further injury to legal users of water.

V. WATERFIX WILL DEGRADE WATER QUALITY AND INCREASE RESIDENCE TIME

Water quality and quantity are flip sides of the same coin; changes in flow change assimilative capacity, residence time and the fate and transport of contaminants. Hydrologic changes modify constituent concentration and bioavailability, which in turn can adversely impact beneficial uses.

Water from the Sacramento River is of significantly better quality than water flowing into the estuary from other tributaries, especially the San Joaquin River. Sacramento River water drawn across the Delta to the export pumps is a major reason water quality in the Delta is better than it would otherwise be. Diversion of millions of acre-feet of relatively good quality Sacramento River water around the Delta will increase the concentration of existing constituents in the surface water remaining in the Delta. It will also increase the residence time of water in the Delta, thereby enhancing the opportunity for bioaccumulation and oxygen depletion to occur. This is exacerbated in tidal environments where pollutants tend to move back and forth with the tides. The CWF analysis of the likelihood and extent of adverse impacts to Delta water quality is woefully inadequate and technically deficient.

Previous efforts to evaluate potential water quality impacts from proposed projects to modify the hydrology of the Delta have largely ignored water quality, with the exception of salt, or relied upon models that track "particles" to evaluate water quality.

However, the majority of pollutants identified as impairing the estuary are non-conservative dissolved forms of pesticides, mercury, nutrients or oxygen demand constituents. Conservative constituents like salt are unacceptable surrogates for the universe of chemical constituents and pathogens degrading and impairing Delta waters.

DWR/USBR (Petitioners) acknowledge that increases in constituent concentration will occur under CWF. For example, the testimony of Parviz Nader-Tehrani states, "For all scenarios except Boundary 2, in the months of July and August there is an increase in EC at Emmaton of about 18-19 percent when compared to the NAA (Exhibit DWR-13, p. 1, Figure EC1)."

The *2015 Public Draft Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement* (RDEIR/SDEIS; Exhibit SWRCB-3) acknowledges that residence time will increase. (Table 8-60a, p, 8-82) For example, the increase in the average residence time (days) in the east Delta during the summer and fall is 51 and 37 percent, respectively. For the south Delta, the increase in residence in the summer and fall is 60 and 290 percent, respectively. However the CWF petition and testimony understate the extent and magnitude of water quality and flow degradation that will occur under the project.

Water degradation, decreases in flow below the North Delta diversion facility and increases in residence time are identified in the RDEIR/SDEIS for boron, bromide, chloride, nitrates, dissolved organic carbon, methyl mercury (from construction and habitat restoration disturbance), harmful algal blooms, and selenium. (CSPA and

Environmental Water Caucus (EWC) comments on the RDEIR/SDEIS, pp. 53-76; source data from Appendix B of the RDEIR/SDEIS can be found as follows: Table Bo-3, p. B-71; Table Br-1, p. B-83; Table Br-5, p. B-87; Tables Cl-6 through Cl-9, pp. B-93 and B-96; Tables N-4 and N-5, p. B-162; Table DOC-1, p. B-171; Tables Se-5, Se-6, and Se-7, pp. B-185 through B-186; and Tables Hg-5, p. B-147, and Hg-7, p. B-149; also, decreases in flow below north Delta diversion facility at Tables B.7-28, B.7-30, pp. B-357, B-358, B-361 and B-362; also, increases in residence time at Table 8-60a, p. 8-82.) (CSPA-18)

I assisted EWC in the preparation of its comments on the RDEIR/SDEIS. To simplify matters and avoid extensive cut and past, I incorporate CSPA-18, pages 53-76 into my testimony, as if contained herein.

I prepared CSPA-19 (CSPA comments on the Chapter 8 of the EIR/EIS (SWRCB-4) that addressed the improper uses of modeling and best professional judgment, reliance upon inadequate data sets and the numerous analytical deficiencies related to water quality parameters). To simplify matters and avoid extensive cut and past, I incorporate CSPA-19, pages 16-50 into my testimony, as if contained herein.

VI. WATERFIX MODELING IS TECHNICALLY DEFICIENT AND NOT BASED UPON BEST AVAILABLE SCIENCE

In a widely quoted comment, statistician E.P. Box remarked, "all models are wrong, some are useful." Models are complex simulations that, at their best, only represent an idealization of actual field conditions. Models can be a black box with a "trust us" outcome. They must be used with extreme caution to ensure that the underlying

model assumptions hold for the site-specific situations being modeled. Subtle changes in coefficients, assumptions or input data can dramatically alter output. It is crucial that models be properly calibrated and verified. The design parameters, assumptions, input data, calibration and validation must be transparent in order to be able to meaningfully evaluate the ability to accurately project values.

CalSim II is like Aladdin's Lamp: it grants wishes to whoever rubs it. It can be manipulated to produce desired results. Even properly operated it is only as accurate as the data and assumptions that are plugged into the model. Petitioners have acknowledged that CalSim II did not or cannot model conditions during a drought scenario when Temporary Urgency Change Petitions (TUCPs) will be required or reservoir levels approach or reach dead-pool. These conditions have historically occurred about five percent of the time.

Petitioners claim that CalSim II and DSM2 are the best scientific water models they have. However, the best models they have should not be confused with "best available science." Best available politics does not equate with best available science. Government agencies including: the U.S. Environmental Protection Agency (EPA), National Marine Fisheries Service (NMFS), U.S Fish and Wildlife Service (USFWS), Delta Stewardship Council and the National Research Council of the National Academies have all developed policies and guidelines regarding best available science. A rigorous, independent peer-review by disinterested experts is an integral requirement in all definitions of best available science. Another common component of best available science is "transparency."

The SWRCB's website observes that "California Health and Safety Code §57004 requires all CalEPA organizations to submit for external peer-review the scientific basis and scientific portion of all proposed policies, plans and regulations. The peer reviewer's responsibility is to determine whether the scientific findings, conclusions, and assumptions are based upon sound scientific knowledge, methods, and practices." For example, the *Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives* was peer-reviewed, as was the *Agricultural Economic Effects of Lower San Joaquin River Flow Alternatives.* The scientific basis of new water quality criteria would need to be peer-reviewed.

It is reasonable to assume that this requirement would also pertain to interim criteria. It has been twenty-one years since the present Bay-Delta Water Quality Control Plan criteria were developed and ten years since the 2006 update that retained the old criteria. Given the numerous delays in present efforts to update the Plan and incorporate new criteria into DWR and USBR's water rights permits an licenses, it is uncertain how long any interim criteria that are issued in this proceeding would remain in place.

The Delta Reform Act requires the SWRCB to include appropriate Delta flow criteria in any change in the point of diversion from the southern Delta to the Sacramento River. (CSPA-87, §85056(c)(2)) Appropriate flow criteria must be informed by the SWRCB's report titled *Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem,* which was based upon best available science. The SWRCB has indicated that it will establish interim criteria in any approval of a change in point of diversion, pending completion of an update to the Bay-Delta water quality control plan.

Since any interim criteria will temporary replace existing promulgated water quality and flow criteria, the scientific basis of new criteria will need to be based upon best available science and subject to peer-review.

There have ben numerous versions and updates of CalSim II since 2002. In 2003, a partial peer-review was conducted. The peer-review report titled, *A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California,* made clear that it did not include a technical analysis. It stated:

> The information we received and the shortness of our meetings with modeling staff precluded a thorough technical analysis of CALSIM II. We believe such a technical review should be carried out. Only then will users of CALSIM II have some assurance as to the appropriateness of its assumptions and to the quality (accuracy) of its results. By necessity our review is more strategic. It offers some suggestions for establishing a more complete technical peer review, for managing the CALSIM II applications and for ensuring greater quality control over the model and its input data, and for increasing the quality of the model, the precision of its results, and their documentation. (CSPA-20, p. 3)

The report recommended:

> To increase the public's confidence in the many components and features of CALSIM II, we suggest that these components of CALSIM be subjected to careful technical peer review by appropriate experts and stakeholders. (Id. p. 2)

The peer-review panel found that CalSim II had not been calibrated or validated for making absolute prediction values. They also expressed skepticism that CalSim II was suitable for making comparative analyses.

> Modelers sometimes make a distinction between the use of a model for absolute versus comparative analyses. In an absolute analysis one runs the model once to predict an outcome. In a comparative analysis, one runs the model twice, once as a baseline and the other with some specific change, in order to assess change in outcome due to the given change in model input

> configuration. The suggestion is that, while the model might not generate a highly reliable absolute prediction because of errors in model specification and/or estimation, nevertheless it might produce a reasonably reliable estimate of the relative change in outcome. The panel is somewhat skeptical of this notion because it relies on the assumption that the model errors which render an absolute forecast unreliable are sufficiently independent of, or orthogonal to, the change being modeled that they do not similarly affect the forecast of change in outcome; they mostly cancel out. This feature of the model is something that would need to be documented rather than merely assumed. (Id. P. 9)

The Department of Civil Engineering University of California at Davis conducted a comprehensive survey of members of California's technical and policy-oriented water management community regarding the use and development of CalSim II in California. Detailed interviews were conducted with individuals from California's water community, including staff from both DWR and USBR (the agencies that created, own, and manage the model) and individuals affiliated with consulting firms, water districts, environmental groups, and universities. The results of the survey, which was funded by the CalFed Science Program and peer-reviewed, was published in March 2005 by Francisco Estuary & Watershed Science as a report titled Musings on a Model, CalSim II in California's Water Community. (CSPA-21, pp. 1-13) The report observed:

> All users agree that CalSim II needs better documentation of the model, data, inputs, and results. CalSim II is data-driven, and so it requires numerous input files, many of which lack documentation. Documentation of assumptions is spotty and very technical when it exists, making it difficult for anyone other than model developers to understand how CalSim arrives at its results. (Id. P. 7)

> There is considerable debate about the current and desirable state of CalSim II's calibration and verification. Its representation of the SWP and CVP includes many simplifications that raise concerns regarding the accuracy of results. (Id. p. 7)

> Many interviewees are concerned that CalSim II's monthly time step cannot capture hydrologic variability adequately and thus does not compute water exports and export capacity accurately, both of which are significant factors in system operations. The model's inability to capture within-month variations sometimes results in overestimates of the volume of water the projects can export from the Sacramento- San Joaquin Bay-Delta and makes it seem easier to meet environmental standards than it is in real operations. (Id. p. 8)

As noted above, there have ben numerous versions and updates of CalSim II since 2002. However, in the thirteen years since its highly critical partial peer-review, CalSim has never been subjected to a comprehensive independent published peer-review. Nor has the independent technical analysis peer-review recommended by the 2003 peer-reviewers been conducted. CalSim II remains largely non-calibrated and unverified. The lack of a current comprehensive peer-review of current versions of a model, that was heavily criticized in a thirteen-year old partial peer-review and that has never been adequately calibrated or validated should serve as a cautionary note to those who make decisions based on CalSim II. Given the controversial nature of policy-making in the Bay-Delta, these needs must be met with a high level of scientific transparency, proper verification and validation, adequate documentation, and rigorous peer-review.

DSM2 is a data-intensive one-dimensional hydrodynamics, water quality and particle tracking simulation model used to simulate hydrodynamics, water quality, and particle tracking in the Sacramento-San Joaquin Delta. All DSM2 model runs (hydrodynamics and water quality) were based on sixteen years of record (1976-1991).

DWR claims that the years 1976-1991 contain a similar spectrum of year types as those reflected in the eighty-two years (1922-2003) included in the CalSim II

simulations. However, DSM2 apparently does not represent the ninety-four year trend of reductions in unimpaired flow into the Delta. Examination of the DWR's chronologically reconstructed Sacramento and San Joaquin Valley water year hydrologic classification indices (CSPA-22) reveals that average total unimpaired flow into the Delta in the fifty-three years between 1922 and 1975 was 22.9 million acre-feet (MAF). The average unimpaired flow in the sixteen years between 1976-1991 that DSM2 utilizes was 22.2 MAF, a drop of 0.7 MAF. However, the average unimpaired flow in the sixteen years between 2000 and 2015 was only 20.2 MAF, a reduction of 2 MAF from flow during the DSM2 simulation years. In other words, the last sixteen years of record averaged 9 percent less average unimpaired flow than the DSM2 modeled period (1976-1991), 11.8% less flow than the average between 1922 and 1975 and 12.9% less flow than the CalSim II modeled period (1922-2003).

This continuing decline in flow has serious implications for assimilative capacity and modeling assumptions about the rate of climate change. It brings into question the CWF's assumption that the period between 1976-1991 is representative of current conditions. For example, decreased flow coupled with a constant pollutant mass loading leads to loss of assimilative capacity and increased pollutant concentration. Consequently, modeling based upon a period of higher flow likely understates existing water quality impacts, especially as most of the ambient data other than electrical conductivity was drawn from old and/or inadequate databases. DSM2 modeling should be predicated upon recent monitoring data and existing and likely future hydrology.

Despite the fact that modeling results are dependent upon the consequences of the future hydrologic cycle, DWR and USBR modeler's cherry picked among different climate change scenarios and failed to fully incorporate risk and uncertainty into their models. Ignoring clear evidence that 2015-2016 hydrology has been drier than 1976-1991 hydrology, which in turn was drier than 1922-1975 hydrology, they failed to compare "best case" and "worst case" climate change scenarios and simply compared CWF to the no-action alternative. (CWIN-6, pp. 8-9)

DSM2 has never been publically peer-reviewed by independent experts and several of its modules have only received limited validation and calibration. Its particle-tracking module was severely criticized by the peer panel review of the California Department of Fish and Wildlife's Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta. (CSPA-23, pp. 7, 17-19).

The 2013 Public Draft Environmental Impact Report/Environmental Impact Statement for the Bay Delta Conservation Plan (SWRCB-4) describes DSM2's limitations as follows:

> DSM2 is a 1D model with inherent limitations in simulating hydrodynamic and transport processes in a complex estuarine environment such as the Sacramento – San Joaquin Delta. DSM2 assumes that velocity in a channel can be adequately represented by a single average velocity over the channel cross-section, meaning that variations both across the width of the channel and through the water column are negligible. DSM2 does not have the ability to model short-circuiting of flow through a reach, where a majority of the flow in a cross-section is confined to a small portion of the cross-section. DSM2 does not conserve momentum at the channel junctions and does not model the secondary currents in a channel. DSM2 also does not

> explicitly account for dispersion due to flow accelerating through channel bends. It cannot model the vertical salinity stratification in the channels.
>
> It has inherent limitations in simulating the hydrodynamics related to the open water areas. Since a reservoir surface area is constant in DSM2, it impacts the stage in the reservoir and thereby impacting the flow exchange with the adjoining channel. Due to the inability to change the cross-sectional area of the reservoir inlets with changing water surface elevation, the final entrance and exit coefficients were fine tuned to match a median flow range. This causes errors in the flow exchange at breaches during the extreme spring and neap tides. Using an arbitrary bottom elevation value for the reservoirs representing the proposed marsh areas to get around the wetting-drying limitation of DSM2 may increase the dilution of salinity in the reservoirs. Accurate representation of RMA's tidal marsh areas, bottom elevations, location of breaches, breach widths, cross-sections, and boundary conditions in DSM2 is critical to the agreement of corroboration results.
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> For open water bodies DSM2 assumes uniform and instantaneous mixing over entire open water area. Thus it does not account for the any salinity gradients that may exist within the open water bodies. Significant uncertainty exists in flow and EC input data related to in-Delta agriculture, which leads to uncertainty in the simulated EC values. Caution needs to be exercised when using EC outputs on a sub-monthly scale. Water quality results inside the water bodies representing the tidal marsh areas were not validated specifically and because of the bottom elevation assumptions, preferably do not use it for analysis. (SWRCB-4, pp. 5A-A49-50)

In other words, in an exceedingly complex Delta with myriad meandering small channels and constantly changing flows, DSM2 modeling output inadequately accounts for varying velocities and secondary currents, channel junctions and open waters, stratification, fluctuating channel beds, turbulent mixing, surface waves, sediment resuspension and agricultural inputs and diversions. And, as previously discussed, DSM2 is dependent on flawed CalSim II output data regarding flows and boundary conditions. While the environmental documents discuss the limitations of DSM2, they fail to account for and disclose the uncertainty of model results. There are few, if any, error bars

attached to predictions and comparisons to indicate to makers and the general public the relative confidence level in the results.

The Review of the Draft BDCP EIR/EIS and Draft BDCP conducted by the Delta Independent Science Board observed,

> "As noted for other chapters in the DEIR/DEIS, a concise and informative summary of the chapter would be extremely useful to readers and reviewers. This chapter, covering water quality impacts of the different Alternatives, is not very informative because of its reliance on a few modeling approaches, most notably CALSIM and DSM2, without an explanation of the limitations of these models. There is a noted lack of emphasis on validating model outputs with observational data, as well as a lack of any presentation or discussion of the uncertainties associated with the models." (SWRCB-52, p. B-22)
>
> As stated above, there is an over-reliance on model outputs, both to describe existing conditions as well as to project the effects of Alternatives on water quality constituents. There do not seem to be either a) attempts to compare model outputs for existing conditions to existing water quality data, or b) calls for monitoring of future conditions in order to inform adaptive management of Draft BDCP implementation. Because models will always be incorrect, such observational data are obviously required. Moreover, models were run for only certain constituents and not others; this needs to be clarified and the reasons for selective applications of models should be explained. (Id., p. B-23)

VII. ADAPTIVE MANAGEMENT IS AN EXCUSE TO DEFER DIFFICULT DECISIONS

DWR and USBR propose Alternative H3+ as the initial operating criteria of CWF. H3+ falls within the range of Alternative 4A scenarios H3 and H4. The specific operating requirements of H3+ will be determined by the respective biological opinions (BiOps). These requirements may change based on adaptive management. For

evaluation purposes, Proponents have established a broad analytical framework comprised of Boundary 1 and Boundary 2. Based upon Figure 11 of DWR exhibit 514, the median difference in combined Delta exports between the two boundaries is approximately 2.8 MAF and Boundary 1 represents an increase in exports of approximately 1.3 MAF (6.1 MAF exports), while Boundary 2 represents a decrease in exports of approximately 1.5 MAF (3.3 MAF exports).

The initial operating criteria will fall within the range of the two boundaries, subject to regulatory requirements imposed by the SWRCB or state and federal BiOps and permits, which will be informed by adaptive management. Adaptive management will also be the core of a collaborative science program that will address uncertainty, facility operations, fish facilities design, habitat restoration and mitigation and, in general, guide the development and implementation of scientific investigations and monitoring and apply new information and insights to management decisions and actions. As envisioned, adaptive management will guide future management decisions in the estuary.

However, adaptive management has a long and checkered history in the Delta. The National Research Council reviewed BDCP and prepared a report titled, "*A Review of the Use of Science and Adaptive Management in California's Draft Bay Delta Conservation Plan.*" It observed:

> Despite numerous attempts to develop and implement adaptive environmental management strategies, many of them have not been successful (Gregory et al., 2006; Walters, 2007). Walters (2007) concluded that most of more than 100 adaptive management efforts worldwide have failed primarily because of institutional problems that include lack of

> resources necessary for expanded monitoring; unwillingness of decision makers to admit and embrace uncertainties in making policy choices; and lack of leadership in implementation. Thus many issues affecting the successful implementation of adaptive management programs are attributable to the context of how they are applied and not necessarily to the approach itself (Gregory et al., 2006). In addition, the aims of adaptive management often conflict with institutional and political preferences for known and predictable outcomes (e.g., Richardson, 2010) and the uncertain and variable nature of natural systems (e.g. Pine et al., 2009). The high cost of adaptive management, and the large number of factors involved also often hinder its application and success (Lee, 1999; NRC, 2003). (CSPA-24, p. 38)

Adaptive management in large, highly complex ecosystems is extremely difficult, time-consuming and expensive. In highly stressed and over-appropriated watersheds where high-value resources and sharp political conflict over management choices are involved, the difficulty increases substantially. Mix in a high degree of risk and uncertainty and the difficulty increases exponentially. Despite the fact that adaptive management has been a core component of BDCP and CWF from the beginning, it remains essentially a concept. As the Delta Independent Science Board, in its 30 September 2015 review of the RDEIR/SDEIS, observed:

> The lack of a substantive treatment of adaptive management in the Current Draft indicates that it is not considered a high priority or the proposers have been unable to develop a substantive idea of how adaptive management would work for the project. (SWRCB-49, p. 5)
>
> We did not find examples of how adaptive management would be applied to assessing - and finding ways to reduce - the environmental impacts of project construction and operations. (p. 5)
>
> The protracted development of the BDCP and its successors has provided ample time for an adaptive-management plan to be fleshed out. The Current Draft does little more than promise that collaborations will occur and that adaptive management will be implemented. This level of assurance contrasts with the central role of adaptive management in the Delta Plan

> and with the need to manage adaptively as climate continues to change and new contingencies arise. (p. 6)

The Delta has been adaptively managed for the last thirty years. Taken together, the vast suite of water quality control plans and water rights decisions by the SWRCB over the last decades essentially constitutes an adaptive management process. CalFed was an elaborately structured water planning and adaptive management program. The CalFed Record of Decision mentions adaptive management 132 times. The array of BiOps issued over the years by USFWS and NMFS and CESA permits issued by CDFW of the past two decades comprise a broad adaptive management scheme. Indeed, the Reasonable and Prudent Alternatives (RPAs) of the BiOps are implemented through adaptive management: the Water Operations Management Team, Smelt Working Group, Delta Operations for Salmonids and Sturgeon Work Group, Sacramento River Temperature Task Group and other groups are adaptive management. In Part 2 of this proceeding, we will provide numerous examples where senior managers and decision makers have ignored and rejected the explicit recommendations made by the scientists, biologists and technical review teams. The Recovery Plan for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon and Central Valley steelhead is based upon adaptive management, as is the Final Restoration Plan for the Anadromous Fish Restoration Program. The Vernalis Adaptive Management Program is self-explanatory. The Interagency Ecological Program and its fifteen Project Work Teams is an adaptive management program, as is the Collaborative Science and Adaptive Management Program. A broad adaptive management program was an essential

component in the Blue Ribbon Task Forces' Delta Vision Report and was mentioned forty-one times in the Delta Vision Strategic Plan. From its inception, BDCP envisioned an extensive adaptive management program. Ten years later, there is no final recommended adaptive management program that has been approved by participating agencies and no agreement to extensively fund such a program.

All of the deficiencies and failures of adaptive management identified by the National Research Council are present in this estuary, on steroids. Managers and decision makers have routinely rejected the "adaptive" recommendations made by scientists. Resource and regulatory agencies have failed to adopt and implement recommended criteria and failed to enforce existing criteria. Financial resources have been lacking and monitoring is woefully insufficient. Adaptive management has not only failed to reverse the downward spiral of native species, it has chaperoned them to the brink of extinction. As adaptive management programs have been stacked on top of each other, native fisheries and lower tropic orders have declined by one to two magnitude and are now faced with extirpation.

For adaptive management to play a meaningful role in the Delta scientists must have the authority to "adapt." Unfortunately, decision-makers and water agencies have not been willing to open their pocketbooks or hand over operational authority to scientists. We can find nothing in the thousands upon thousands of pages of BDCP/CWF plans or environmental review documents that provide any assurance or evidence that adaptive management is likely to succeed. As practiced in the Delta, adaptive management has served as a shibboleth, a panacea, an excuse to delay and a subterfuge to

avoid having to make difficult, unpleasant or politically untenable decisions. That's not merely an opinion: it's the track record of adaptive management in this estuary. Its not that the scientific community doesn't understand what needs to be done: it's that agency heads and regulators refuse to implement them.

Moreover, there appears to be no place in the CWF adaptive management program that provides for participation of the general public and legal users of water to evaluate potential injury resulting from adaptive management actions. In fact, the proposed adaptive management plan virtually ignores other legal users of water.

ECONorthwest analyzed DWR an USBR's claim that the proposal would not injure other users of water and prepared a report titled *Analysis of Proposed Change Point of Diversion and the No Injury Rule.* (CWIN-6) The report found that the Petitioners failed to evaluate whether their proposal would injure other legal users of water and failed to follow professional standards and methods of analysis. (*Ibid.* p. 2) It also found that the proposed adaptive management plan suffered from fatal errors, including failure to consider other legal users of water, fully incorporate uncertainty and risk, include the state of science on adaptive management and develop a sufficient long-term funding plan. (*Ibid*. pp. 7-13)

VIII. THE PUBLIC TRUST IS PERTINENT TO PART ONE OF THIS HEARING

The Public Trust cannot be separated from considerations regarding injury to legal users of water. Flow and water quality are public trust issues and degradation of either diminishes the beneficial uses of water and causes injury to legal users of water and the

beneficial uses of water. Consideration of CWF also involves the reasonable use and reasonable method of diversion of water. We could find no discussion of the public trust or even mention of the words "public trust" in DWR or USBR's petition or testimony.

As noted above, the Delta Reform Act declared, the "longstanding constitutional principle of reasonable use and the public trust doctrine shall be the foundation of state water management policy and are particularly important and applicable to the Delta." (CSPA-26, §85023) Injury to Public Trust resources extends to those who legally divert water directly like farmers and municipalities to those who legally use water for their livelihood, subsistence or recreation. It further extends to those who economically depend upon legal diverters of water and to those whose pocketbook, health and quality of life are injured by the degradation of water and the loss of ecosystem services dependent upon a healthy Public Trust.

CSPA has long advocated that a balancing of the Public Trust is fundamental in any water rights proceeding. We previously submitted a comprehensive report to the SWRCB on balancing the Public Trust prepared ECONorthwest and titled, *Bay-Delta Water, Economics of Choice*. (CSPA-27) The report addresses the relevant scope of Public Trust balancing, including economic analyses, risk and uncertainty, ecological services, best practices, allocation of scarce resources among competing demands and environmental justice concerns.

The SWRCB has previously indicated that the appropriate place to address Public Trust concerns is when the Board considers incorporating new Bay-Delta Water Quality Control Plan criteria into DWR and USBR's water rights. It has been twenty-one years

since the present Bay-Delta Plan criteria were adopted and ten years since the 2006 update. Federal law requires triennial updates. The SWRCB's presently anticipates adoption of the next update in 2018. However, every scheduled date in the present effort has been delayed by years and no date has been established to implement changes to the Bay-Delta Plan into water rights. It took five years for the SWRCB to incorporate the 1995 criteria into D-1641.

Given the current Bay-Delta Plan update schedule, the time it will take to consider public trust concerns and incorporate new criteria into water rights plus inevitable delays, it is uncertain how long interim flow requirements that are issued in this proceeding will remain in place. The Public Trust resources of the Delta may not survive another decade delay before being addressed. The present proceeding is the appropriate place to consider public trust issues and a comprehensive balancing of public trust resources.

IX. PROJECT PROPONENTS HAVE FAILED TO PROVIDE SUFFICIENT INFORMATION FOR LEGAL USERS OF WATER TO DETERMINE INJURY

By simply assuming that injury to existing water users is predicated upon whether or not CWF will meet D-1641 and the BiOps, DWR and USBR have failed to provide sufficient information necessary to establish that CWF will not injure existing water rights users. Their failure to provide sufficient definitive information about the project makes it extremely difficult, if not impossible, for the public to evaluate whether or not CWF will cause injury. Essentially, they have attempted to transfer their legal burden to prove no injury to the general public without providing necessary information to enable water users to determine injury. For example, among other things, CWF proponents:

1. Claim that CWF will cause no or minimal injury to legal users of water based upon compliance with grossly deficient water quality and flow criteria has caused or contributed to the degradation of the Delta.
2. Insist their project be considered for approval before the SWRCB updates and revises the egregiously inadequate existing Bay-Delta Water Quality Control Plan standards for water quality and flow.
3. Essentially ignore a number of identified beneficial uses, such as subsistence fishing, contact recreation and aesthetic enjoyment.
4. Fail to examine potential impacts to specific users at specific diversion points or use areas, such as the City of Stockton's Delta water intake, areas of high recreational water contact, and areas important to subsistence fishing.
5. Employ highly questionable models that have not been peer-reviewed, calibrated or validated. When questioned on monitoring results, they respond by suggesting that those concerned should acquire a program to download raw data that is not in the record and that must be interpreted and analyzed by highly trained specialists.
6. Downplay CWF's reliance on TUCPs during major drought periods and assume that the SWRCB will relax water quality standards whenever requested.

7. Use inadequate and outdated data sets for chemical constituents routinely found in Delta waters and employ technically unsupportable methodologies in analyzing potential harmful effects.

8. Provide only a skeletal concept of adaptive management, without any analysis of the likelihood that adaptive management can be meaningfully or successfully implemented, despite the central role that adaptive management would play in their project.

9. Morph the project from BDCP to CWF into a modified proposal that includes boundaries that were never analyzed in previous environmental documents.

10. Minimize the necessity of a final environmental document or the need to respond to critical comments on previous draft versions to enable the public evaluate potential injury.

In its review of the Bay Delta Conservation Plan/California WaterFix RDEIR/SDEIS, the Delta Independent Science Board observed:

> These reasonable expectations go largely unmet in the Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement Draft (herein, "the Current Draft"). "We do not attempt to determine whether this report fulfills the letter of the law. But we find the Current Draft sufficiently incomplete and opaque to deter its evaluation and use by decision- makers, resource managers, scientists, and the broader public." (SWRCB-49, p. 1)

In its review of the Supplemental Draft Environmental Impact Statement of the Bay Delta Conservation Plan/California WaterFix, EPA evaluated the document and wrote:

> "The unusual circumstances of this project mean that the information is not yet available for a complete evaluation of environmental impacts – and for that reason a rating of *"3"(Inadequate)* for the SDEIS is required – but EPA expects that the project will continue to move forward, with those necessary additional pieces to be supplied as the later regulatory process proceed. (CSPA-25, p. 4)

If highly trained analysts and scientists from the Delta Independent Science Board and EPA cannot find enough reliable information on CWF in the environmental documents on which to base an opinion, the general populace that may be injured by the project will certainly be unable to render an informed assessment. Nor can the public rely on the assurance, integrity and professionalism of water agencies whose historical track record is a scandalous failure to protect the public trust resources of the Delta and tributaries.

Moreover, CWF doesn't pass the smell test of common sense. Over mere decades, construction and operation of massive water diversion projects have deprived the Bay-Delta estuary of half its flow; turned the natural hydrograph on its head, reduced temporal and spatial variability; eliminated crucial riparian and aquatic habitat, complexity and diversity and decreased dilution flows necessary to assimilate increased pollutant mass loading. It is not surprising that an ecosystem that evolved and prospered under a state of nature has been brought to the brink of destruction. No estuarine ecosystem in the world has survived this level of abuse.

Over the years, I have repeatedly asked many representatives of BDCP and CWF, as well as fish and regulatory agency scientists, two questions. First, "can you name an estuary, anywhere in the world, that has been deprived of half its historical flow where the native ecosystem and water quality has been protected or restored by further depriving it of millions of acre-feet of water?" Second, "can you identify an impaired waterbody anywhere in the world whose water quality has been protected or improved by eliminating millions of acre-feet of its best quality dilution flow?" I have yet to receive an affirmative response!

X. WATERFIX WILL CAUSE INJURY TO CSPA

CSPA believes it has been injured by operation of the SWP and CVP and that present water quality would be significantly better had the projects never been constructed and operated. That injury will be exacerbated by construction and operation of CWF. The value of CSPA's property and the options that CSPA will have in putting its property to the highest beneficial use will be constrained and harmed by CWF. The upstream diversion of millions of acre-feet of the best quality water entering the Delta will facilitate saltwater intrusion and increase the concentration of existing pollutants. Increases in residence time will provide enhanced opportunity for pollutants to interact with the environment.

CWF's reliance upon TUCP's to weaken flow and water quality criteria during drought scenarios has the potential to injure water users because, if granted, relaxed flow and water quality criteria will degrade water quality and cause injury. Since TUCPs are routinely approved by the SWRCB's Executive Officer, there is no formal proceeding for

legal water users to demonstrate harm before criteria is relaxed. Likewise, agency decisions made pursuant to adaptive management have the potential to injure water users and, like TUCPs, there is no formal proceeding for water users to demonstrate harm before decisions are implemented. Protestants will therefore be deprived of due process and limited to seeking redress of injury after the fact.

While the serious deficiencies in CWF's environmental analyses makes the extent and magnitude of injury difficult to ascertain, the environmental documents are sufficient to establish that CWF operation will increase water quality degradation that will likely injure a wide range of beneficial uses and legal users of water.

Executed on this 31st day of August 2016 in Stockton, California.

Bill Jennings