Public Comment
Bay-Delta Phase II Working Draft Report
Deadline: 12/16/16 12:00 noon

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Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
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Sacramento, CA 95814-0100
commentletters@waterboards.ca.gov
via e-mail

Subject: Comments on the Working Draft Scientific Basis Report for Phase II of the update of the Bay-Delta Plan

Dear Ms. Townsend:

The California Sportfishing Protection Alliance respectfully submits comments on the October, 2016 *Working Draft Scientific Basis Report for New and Revised Flow Requirements on the Sacramento River and Tributaries, Eastside Tributaries to the Delta, Delta Outflow, and Interior Delta Operations* (Report), for use in Phase II of the update of the Bay-Delta Plan.

Overall, the Report does a good job of synthesizing and describing key elements that will be necessary to support the flow requirements the Board will develop during Phase II of Bay-Delta Plan. It is well documented and cited, both with historical scientific information and with new scientific information that has appeared since the publication of the Board's 2010 *Delta Flow Criteria Report*.

Our comments are organized as follows. We present specific comments on Chapters 2 and 3 of the Report on a line-by-line basis, citing the page number and paragraph of the section to which each comment refers. We conclude with a narrative summary of comments and recommendations, which is generally a response to Chapter 5.

Comments on Chapter 2

Comment: P2-12, para 2. Bend Bridge flows include major tributary inflows below Keswick and should not be compared to Keswick. The report should add statistics for Keswick releases or for the Clear Creek (CCR) gauge approximately 9 miles downstream of Keswick. This would allow analysis of the effects of hydrology on the important salmon spawning reach immediately downstream of Keswick. Bend Bridge also includes substantial April-October flow in the Sacramento River that is diverted before it reaches confluence with the Feather River. While statistics for Freeport are very useful and should be retained, flow at Freeport also reflects inflow from the Feather River (including the Yuba and Bear rivers) and the American River watershed. To allow clear analysis about the effects to Delta inflow of diversion from the Sacramento River upstream of the Feather River, the report should also add statistics for the Sacramento River at the Wilkins Slough (WLK) gauge.

Comment: P2-31, para 1. We recommend you modify this section to capture the description presented here: Lower Yuba flow is often dominated in winter and spring by unregulated flow from the South Yuba River downstream of Spaulding Dam, and to a lesser degree by Deer and Dry Creeks. During high flow events on the Middle Yuba River, the Middle Yuba can also add unregulated flow that is not captured at Our House Diversion Dam and Log Cabin Diversion Dam. When flood releases are made from New Bullards Bar Reservoir on the North Yuba, these flows often dominate flows in the lower Yuba River. Flood releases from New Bullards Bar occur in about half of all water years. Lower river flow below Daguerre is affected by agricultural diversions that generally start in April or May and end in October or November.

Comment: p. 2-54, para 5. The Report states that without approximately 4000 cfs of summer baseflow in the Sacramento River at Red Bluff under pre-development conditions, the Sacramento River would have nearly dried up in the fall. Unimpaired summer baseflow from the Feather River watershed (whose confluence with Sacramento River is well downstream of Red Bluff) was almost always 1000 cfs or greater due to springs now inundated by Lake Almanor on the North Fork Feather (see historical records for USGS gage number 11399500, 1906-1914) and due to flow in the Middle Fork Feather. It is unclear how much of this flow would have reached the Delta as inflow in pre-development conditions, but the volume merits further research. In any case, the Report should acknowledge unimpaired summer flow in the Feather River.

Comment: P2-55, para 1. Quoting Fleenor (2010), the Report states that reduction in April-June Delta inflow is largely attributable to reduced inflow from the San Joaquin watershed. This explains only part of the condition. Except in years that feature flood releases, reservoirs in the Sacramento River watershed capture substantial flow in the April-May time period. On the Sacramento River, irrigation diversions beginning in mid-April divert substantial flow, such that 50% exceedance percent of Sacramento River unimpaired flow at Freeport in May is 45% (Table 2.2-2; contrast Table 2.2-1 for Bend Bridge, where the 50% exceedance May figure is 95%). In addition, Delta export restrictions in these months cause CVP and SWP operators to limit releases from the CVP and SWP north-of-Delta reservoirs until Delta constraints are lessened beginning July 1. This combination of natural, demand and regulatory factors significantly reduces Delta inflow from the Sacramento River in April-May. The Report should be modified to reflect these facts.

Comment: P2-55, para 4. The Report does not (and should) describe the operation of the gravity-fed diversion into Clifton Court, especially relative to the daily and bimonthly spring-neap tidal cycles, which has significant effects on Delta hydrology.

Comment: P2-57, para 6. The description of the DCC and its effects is incomplete. For example, the Report does not discuss the relationship of DCC operation to tides and Georgiana Slough, or its effects on Mokelumne River outflow. Operational considerations are not limited to winter-run salmon: the Report should describe DCC's operational schedule and various effects in more detail, including effects on other runs of Sacramento River salmon and other fish species, effects on Mokelumne River salmon adults and juveniles, effects on Delta hydrodynamics at Jersey Point, and effects on location of X2 and entrainment of Delta smelt.

Comment: P2-60, para 5. The Report appropriately discusses the inaccuracies of NDOI and considers possible modifications to NDOI. Salinity, for which there are multiple sensors in the Delta, is accurately measurable. The final Report should consider an analysis in which measures of the salinity field are used for Delta flow compliance rather than NDOI or another outflow index. As a subset of such an analysis, the final Report should consider an analysis in which salinity is used for compliance under conditions of relatively low flow. In both cases, this would require development of environmental as well as agricultural objectives for salinity.

Comment: P2-68, para 4. Montezuma Slough has historically been a critical sub-element of the LSZ with its own X2. It is an important habitat component of the Bay-Delta estuary in its own right. Sustaining its low salinity signature with

use of the gates is a potentially important tool but not without consequences to the San Joaquin side of the West Delta. The slough may be a critical last refuge of Delta smelt.

Comment: P2-69, para 2. The past four years of drought deserve special attention because the Delta was managed differently with TUCPs. This new management approach needs more discussion. There also needs to be analysis that supports setting standards that serve as a default in drought conditions and that in the vast majority of cases do not require TUCPs.

Comments on Chapter 3

Comment: P3-4, para 6. We recommend adding the following: Timing dam releases to coincide with natural flow events can improve connectivity. At present dam operators tend to capture as much stormflow as possible, and CVP and SWP operators tend to maximize export of uncontrolled stormflow.

Comment: P3-5, para 2. We recommend adding the following: Where floodplain inundation is lessened by reservoir storage, there are available measures to retain flooded waters longer through controlled management.

Comment: P3-5, para 3-5. We recommend adding the following: Reservoir operations for hydropower, particularly peaking operations, also affect the thermal conditions downstream. Peaking operations affect the flow-through of water through afterbays by interrupting underflow of cold water or by releasing water that is warmer than water released through outlets unconnected to power production. There are opportunities to better protect fish habitat at nearly all dams in the Central Valley through improvements in operations and infrastructure.

Comment: P3-6, para 1. The discussion of thermal suitability for salmonids in this section is incomplete; the mention of possible growth at 25°C is misleading, limited to extremely productive river reaches like parts of the Shasta River. We can think of no such productivity in the Bay-Delta watershed. We recommend refining the description of thermal suitability as follows: There is little potential salmonid growth above 20°C or below 10°C. Target optimal growth is generally 14-16°C, with good growth at the margins of this range. Disease and predation are also more prevalent above 20°C. Reproduction is compromised above 15°C.

Comment: P3-7, para 2. We recommend that you add the following: Delta outflow (and inflows) also helps in the transport of larval and juvenile fishes from freshwater

spawning areas to downstream low salinity (brackish) rearing areas.

Comment: P3-9, para 2. This description of the effects of the DCC is incomplete. We recommend adding: The effects of DCC operation vary with the level of exports and the level of flow moving down the San Joaquin River. In itself, opening the DCC can make interior Delta flow patterns more natural because it creates conditions of positive outflow at Jersey Point. During conditions of low exports, open DCC can benefit juvenile salmon migrating down the San Joaquin, as well as other species in the Central Delta, by augmenting flow from Jersey Point to confluence with the Sacramento. It is the operation of export facilities that creates the reverse flow pattern and the reduction of variability.

Comment: P3-14, para 1. Spring-run juveniles are predominantly ocean type in the Central Valley. See e.g. CDFW, Pre-Spawn Mortality Reports for Butte Creek, published each year since 2001. See also hatchery reports from the Feather River Fish Hatchery. We recommend you add discussion to description of spring-run life history.

Comment: P3-15, para 4. Many salmon emigrate as fry. See Zeug et al. (2014). This is not simply an involuntary phenomenon, but appears to be part of the life history strategy. We recommend you revise this paragraph to be consistent with Zeug. This has practical importance because fry rear in the Delta and even in the Bay.

Comment: P3-15, para 6. As noted above, many salmon begin emigration as fry. We recommend you revise this paragraph to indicate that smoltification can take place not only in the natal river, but also in the Delta or Bay, or in transit from natal rivers.

Comment: P3-17, para 1. The references regarding duration of residence in the Delta pertain to wild and hatchery smolts from upriver, not to fry rearing in Delta, which depend heavily on Delta rearing and residency. Del Rosario et al. (2010) also describe longer residence in the Delta by winter- run, particularly in the absence of storm events. We suggest you expand this paragraph to describe this diversity.

Comment: P3-39, paras 4 & 5. Consistent with our comment regarding p. 3-9, we believe the description of effects of DCC is overly simplified. The effects of DCC operation are interdependent with Vernalis flow and exports. Open DCC, when combined with low export levels and positive net flow at Jersey Point can encourage outmigration of salmonids in the Central Delta. This includes Sacramento River salmonids entrained through the DCC, Mokelumne River salmonids, and San Joaquin River salmonids. Mokelumne River salmonids in

particular may benefit from open DCC if they are able to "surf the wave" of water flowing from the DCC, provided that the primary direction of water moving down the Mokelumne exits the Central Delta to the west and does not direct fish toward the export pumps. Under these circumstances, survival can be poorer for San Joaquin salmon and for Sacramento River salmon that pass into interior Delta when the DCC is closed than when DCC is open.

Comment: P3-46, paras 4-7. We recommend that the Report add narrative to discuss the effect of summer conditions on longfin smelt. Summer conditions in the Delta, including the generally eastward movement of the low salinity zone (LSZ), deteriorated in the 1990's and especially in the 2000's following the implementation of D-1641. Declines in the FMWT index are partly attributable to poor summer LSZ habitat. Improved summer outflows from the Delta would move the LSZ westward, benefitting longfin. Note that in 2011, part of the benefit to longfin was higher summer outflows. In 2014 and 2015, TUCP's during the summer reduced outflow to almost nothing, contributing in substantial part to the crash of longfin (and Delta smelt).)

Comment: P3-53 to P3-56. The discussion of sturgeon recruitment should add discussion of the relative importance of spring-summer conditions on the Sacramento River. While the correlation holds for recruitment and outflow, the causal mechanism is likely in some significant part conditions in the Sacramento River (which almost always features high flow conditions when there is also high Delta outflow). This is important because protections may be necessary for in-river conditions as well as for outflow.

Comment: P3-58, para 2. The discussion of splittail recruitment should focus on floodplain inundation, particularly in the Yolo Bypass (but should also mention the importance of floodplain use in the San Joaquin system). While the correlation holds for recruitment and outflow, outflow per se is not the flow parameter that is most beneficial (the correlation holds because high outflow also correlates in relevant cases to floodplain inundation). Further, a Fremont Weir gate is only a limited case of the need to improve floodplain inundation in the Yolo Bypass. In itself, a Fremont Weir gate would add only 3,000 to 6,000 cfs to the Bypass in winter. The benefits to splittail occur during periods of prolonged and massive floodplain inundation, such as in 2011.

Comment: P3-62, para 2. We recommend that the authors review the salvage numbers for splittail in 2011 and modify the narrative. In 2011, literally millions of splittail were entrained. This level of entrainment can significantly reduce recruitment, which may have a population level effect considering that recruitment appears limited to wet years.

Comment: P3-62, para 3. The overview of Delta smelt promotes many misconceptions and should be expanded and revised. The population is far below the cited 2% of recent historical level. Most Delta smelt do not get to rear in Suisun Bay, but are forced to rear upstream in the Delta, because limited outflow makes the conditions in Suisun Bay too saline. The abundance of larvae in this epoch of overall critically low abundance is likely most related to the number of surviving adults, which is measured in the prior summer and fall. Larvae are tidally transported downstream in spring, not summer. April and May exports can decimate larval smelt in dry years; entrainment effects are not limited to winter, early spring and summer.

Comment: P3-62, para 5. Adult smelt tidally surf up the Sacramento and San Joaquin channels in the Delta seeking fresh water. In drier years, this takes them up into Cache Slough and Yolo Bypass at times when the Central Delta is too salty to serve as Delta smelt spawning habitat. Otherwise, the Sacramento and San Joaquin channels are the principal spawning areas.

Comment: P3-63, para 3. Delta outflow determines not only the rate of movement of Delta smelt toward the Low Salinity Zone, but also the location of the LSZ. The text should be modified to clarity this, and the consequences. Low flows put LSZ up in the Delta, close to influence of export pumps. By late spring, water temperatures get high in dry years in the LSZ because of its upstream location and lower inflows. By summer, young smelt for the most part have reached their X2/LSZ target, but that target has cooler temperatures, higher turbidity and greater plankton food only when it is located sufficiently downstream out of the Delta. Summer to fall "survival" is most related to location of LSZ and its conditions (e.g. water temperature).

Comment: P3-65, para 1. We recommend you add at the conclusion of this paragraph: Recent reviews indicate that outflow and export levels year-round affect smelt production. Smelt can be decimated in any season.

Comment: P3-65, para 2. We recommend that you add before the final sentence of this paragraph: However, it was generally understood that the surveys under-sampled Delta smelt in wet years, especially prior to 2000.

Comment: P3-65, para 3. These recent analyses depicting the role of parental stock size in Delta smelt survival and recruitment are a valid upgrade to previously biased analyses that did not consider all factors involved. They confirm that previous analyses and conclusions were not robust.

Comment: P3-65, para 4. The final paragraph on page 3-65, which suggests managers can reduce Delta flows once stock levels recover, is a policy statement

masquerading as science and should be deleted. If high stock levels in themselves had been sufficient to protect Delta smelt, Delta smelt would not be on the edge of extinction. The imagined level of recovery is at this time frankly unimaginable, and too many other factors in the recruitment process have also changed (e.g., physical habitat, predators, climate change, etc.). In addition, the paragraph represents the kind of policy that created the problem in the first place, where crisis is the focus of water management for environmental purposes, and the apparent absence of crisis becomes a justification for cutting flows.

Comment: P3-67, para 1. We would describe science regarding summer outflow as recent, not "emerging." As written and shown in Figure 3.8-3, the relation of summer outflow and STN/FMWT data is statistically significant in all summer months. We recommend that the Report delete the last sentence of this paragraph, and replace it with: In light of the condition of the Delta smelt population, the Board will need to improve summer outflow as part of its overall update of the Water Quality Control Plan.

Comment: P3-68, para 1. Fall flows are certainly related to previous winter-spring-summer flows, so it is inherently hard to separate effects without doing something like dry spring-wet fall vs wet spring-dry fall tests. Progressively lower relative fall flows could be a reason for the POD decline. With less winter-spring exports there has been a shift to fall and summer exports. The Board is going to have to consider requirements to protect Delta smelt for each month of the year, and consider those requirements in the context of overall Delta operations.

Comment: P3-69, Fig 3.8-1. It is possible to kill Delta smelt in any month of the year, and over the past sixteen years Delta operations have done an exceptional job. Except for the addition of an inadequate summer X2 requirement, Figure 3.8-1 shows the failed requirements that have brought smelt to the edge of extinction. To protect Delta smelt, the Board needs to rethink outflow and/or X2 requirements for every month, and reevaluate OMR levels in at least the December-June time period.

For example, absence of default OMR restrictions in December, combined with capture of almost all December inflow from the San Joaquin, creates a dynamic where December storms trigger increased exports, pulling the LSZ into the Central Delta. There are no OMR protections for Delta smelt (or winter-run salmon) in December unless salvage numbers increase to a point unlikely to be reached because of low populations, AND a group of fisheries agencies managers signs off on specific protections. The biological opinions contain triggers that rely on salvage to initiate protective measures, but numbers of

some species are so low that salvage and other "real-time" management may not protect those very species at the precipice of extinction.

Comment: P3-70, para 1. The FMWT index is related to flow in that year, so both flow and adult numbers should be related to the following year's larval abundance. These factors are not independent. However, dividing by another non-independent variable would make any stat professor scream. In the end, it could be that fall X2 might have little effect, because the adults produced by spring-summer flows might be fine wherever X2 is in the fall, but to do a proper analysis requires implementation of a better stat design.

General Comments on Chapter 5: Recommended New and Revised Flow Requirements

The introduction to Chapter 5 of the Report notes on p. 5-1: "While there are additional flow and operational requirements included in ESA and CESA requirements to avoid jeopardy of listed species, the State Water Board has an independent and distinct obligation to reasonably protect fish and wildlife that may extend beyond the ESA and CESA requirements." In the wake of the passage of S. 612 on December 9, 2016, this observation takes on an additional significance.

It is not only that the standards under the Board's authority, including the authority delegated to the Board by the federal Clean Water Act, are different and in some cases more protective than those afforded by the federal Endangered Species Act. Now, the Board cannot assume as a baseline condition the application of the ESA as we have known it for the past 7-8 years. First, those biological opinions may change; consultation is already underway. Second, those opinions may be enforced less rigorously and may be specifically weakened by the implementation of federal law. S. 612 explicitly calls out additional reliance on "real-time" monitoring of fish presence before exports, which are otherwise to be "maximized," are reduced. This reliance on proof of direct effects stands in complete opposition to the 2010 *Delta Flow Criteria Report* and to the extensive science summarized and cited in the present Report, whose very premise is the comprehensive understanding and systemic protection of Bay-Delta ecosystem.

At each step of the way in the development and rollout of the Bay-Delta Plan, various water users attempt to re-argue the science that was accepted in 2010 and that is, now, developed further in the present Report. They advocate for a proof of direct effect as a precondition to protective actions. Now that Congress has substantially mandated this approach by the federal agencies, it is vitally important that the Board defend its science and move forward, not back.

The Board must develop a Bay-Delta Plan whose protections for the Bay-Delta ecosystem stand on their own. As a start, the Board must adopt OMR requirements in the Plan, or more simply, export restrictions. However, we do not recommend, as suggested in the Report, tying OMR to the observed presence of fish of concern. This type of management is ineffective because its premises are purposely limiting. Observed presence does not even account for life stages of fish that are not detectable (e.g. smelt larvae) and does not account for the extensive fish mortality that occurs in the Central Delta before fish reach the pumps. Instead, we recommend OMR or export restrictions based on actual daily Sacramento River and San Joaquin River inflows, with required values adjusted by month and year type. Further, the Board should limit dependence on committees in which group consensus is required to implement measures for ecosystem protection, particularly with federal managers whose policy direction is explicitly weighted toward water supply.

Overall, there is much to like in Chapter 5, and there are also areas that cause concern.

The Report proposes to use percent of unimpaired flow as the general basis for flow requirements. On the whole, this is positive, and generally consistent with the 2010 *Delta Flow Criteria Report*. However, it is not entirely clear in Chapter 5 *how* the Board proposes to use unimpaired flow. It is alternatively a potential element of an explicit flow requirement, a basis for comparison with existing flows, and a basis for allocation of amounts of water for instream and other purposes. Equally, the range of 35 to 75% of unimpaired flow as described is so vague that it is almost meaningless. On this score, it would be very helpful to further break down the proposed flow ranges by area: for example, Delta outflow, Delta inflow, flow in specific tributaries, and flow in the Sacramento River. In addition, the Board should generally adopt flow requirements directly tied to percent of unimpaired flow in preference to blocks of water or "flow sculpting."

The SACWAM model will allow the Board to evaluate flows and operations on each tributary. It is important not to simply aggregate "Delta inflow," but rather to do the analysis for each tributary. Part of this analysis will require evaluation of the specific uses, infrastructure, and operations on each tributary. Almost every major tributary in the Sacramento River watershed, and each Eastside tributary, has unique features and issues that require specific consideration and analysis. This analysis will be a key part of the Board's decision making. The Board should start and do this important work now, or risk a Phase II decision that inappropriately and ineffectively punts both the real decisions and the impacts analysis. As a goal, the Board should plan to set specific flow requirements for each major tributary as part of its Phase II objectives, and wherever appropriate, temperature and carryover requirements as well.

The San Joaquin watershed has major rim reservoirs that capture almost all its inflow to the Delta, and thus provides little unregulated flow to the Delta except during "flood flow" conditions. Unlike the San Joaquin, the Sacramento River watershed has substantial

unregulated flow during storm events, even during conditions where reservoirs are capturing most of their inflow. The Report recognizes that some of this unregulated flow may in the future be captured by new diversions, facilities or operations, and thus contemplates the need to increase some explicit flow requirements to offset such potential future development. However, this analysis and discussion is framed negatively in the sense that reduction of flow below a defined minimum may be detrimental to fish or other instream uses. We are particularly concerned, for example, that evaluation of number of days when outflows are greater than or equal to 17,000 cfs or 20,000 cfs (as in figures 5.2-1, 5.2-2 and 5.2-3) simply sets the table for efforts to make these minimally beneficial figures the new target flows for Delta outflow.

The final Report should add a section in which the benefits of high flows are framed positively, as benefits. In a limited way, this approach was adopted by the Delta Environmental Flows Group in the 2010 flow criteria proceeding by looking at the need for certain flow levels in a certain number of years out of any ten year sequence. A positively framed scientific basis will also provide the Board with a method to evaluate any proposed reductions in unregulated flow, eliminating the presumption that unregulated water is by definition water available for appropriation. One of the principal benefits of specifically tying outflow requirements to percent of unimpaired flow is that it avoids targeting the minimally beneficial figures as the desired flow.

The description of the blockage by rim dams of passage to historic salmonid habitat, and the consequent need to manage cold water downstream of these dams, is a fair point. Salmon and steelhead are now confined to the valley floor, forced to spawn in habitat that historically was often used only for migration. April-October flows that maintain appropriate water temperatures below major dams must often be inconsistent with the pattern of the natural hydrograph. However, for this flow pattern to be effective, there must be cold water in the reservoirs to manage. Chapter 5 of the Report appears to contemplate carryover storage as part of the requirements of the Plan, but the intent is not entirely clear. The final Report should rigorously analyze carryover storage options for each of the major reservoirs, and the Board should implement carryover storage requirements as part of the Plan unless operators can conclusively demonstrate that their existing operating rules are sufficient.

The Report announces the intention to set flow requirements in every month. This is appropriate. In the Delta, and in most major Phase II tributaries, there are no months in which critical resources are not at stake or in which a perfunctory flow requirement is defensible. X2 or EC requirements in particular require year-round values. In addition, X2 or EC requirements in the Delta need greater granularity. The D-1641 requirements based in part on month-long averages allow weeks of un-protective conditions followed by operations whose purpose is simply to make the average. The Board should evaluate shorter compliance intervals, including daily requirements with, if necessary, a daily exceedance allowance.

CSPA remains concerned that the adaptive management construct that the Board has advanced in Phase I of the update of the Bay-Delta plan will carry over to Phase II. Overall, we see it as a likely mechanism to undo much of the good science that the Board has developed and to avoid making hard but clearly needed decisions now. The intention announced in the Report to develop numeric biological goals and objectives for the Sacramento River system is positive, and will help to provide a scientific basis for adaptive management. However, we believe that adaptive management needs to be limited in scope, with clearly defined decision space and triggers. Adaptive management must have limited authority to modify requirements that the Board establishes in the first instance on the basis that they will protect resources. We are also concerned with the proposed composition of adaptive management groups and committees, which in Phase I appear heavily weighted toward water user interests, whose balancing by fisheries agencies has been historically ineffective, and whose federal representatives now have policy direction that is of serious concern. Please see additional comments on adaptive management in our forthcoming comments on the Substitute Environmental Document for Phase I of the update of the Bay-Delta Plan.

As noted above, CSPA believes there are times when April or May opening of the Cross Channel Gates could have a beneficial effect for smelt and for salmonids migrating out of the Mokelumne and San Joaquin rivers. The problem is not the gates per se, but their interaction with export operations. In times when exports are low and San Joaquin River outflows are high or relatively high, opening the Cross Channel Gates in April and May may benefit both smelt and salmon. Of course, such benefits would depend on relatively low levels of exports. We recommend that the Board consider a trigger or option based on exports and flows in both the San Joaquin and Sacramento rivers. Generally speaking, CSPA supports Cross Channel Gate closure in October to reduce straying of Mokelumne River adult salmon.

In Phase II, the Board must consider export operations in the context of flows coming down the San Joaquin River as a result of the requirements the Board develops in Phase I. The Vernalis Adaptive Management Program recognized the benefit of limiting Delta exports during high spring San Joaquin flows; however, this duration of this limitation, like the VAMP pulse flow, was only 31 days. The new Phase I flow requirements are likely to increase flows in the San Joaquin River in the February through June period. The Board will need to determine export limitations throughout this five month window to improve the benefit to in-Delta aquatic resources of these increased San Joaquin flows, and to assure that these flows do not become an unpaid water transfer from San Joaquin tributaries to export contractors. This exercise is considerably more complex than the one month restriction implemented under VAMP. We note that the research by Sturrock et al. (2015) (*Reconstructing the Migratory Behavior and Long-Term Survivorship of Juvenile Chinook Salmon under Contrasting Hydrologic Regimes*), presented to the Board in the Phase I hearing November 29, 2016, emphasized the importance of life history diversity in the San

Joaquin watershed. This work should be added to the references in the final report and used in the Board's analysis of the interaction between exports and San Joaquin flows. The one month limitation of exports under VAMP was partially protective only for the late-emerging smolts from the San Joaquin. We recommend that the Board analyze different formulas for export limitations in relation to February-June San Joaquin flows as a subset of more general export limitations. The Board should evaluate tying export limitations to various combinations of Sacramento River flow and San Joaquin River flow, as we described more generally for export limitations, above.

Conclusion

Board staff has laid a solid foundation in the Report from which the Board can analyze options for flow and other management improvements in Phase II of the update of the Bay-Delta Plan. We ask that the Board consider our comments and that the staff incorporate our recommendations in the final Report. Thank you for the opportunity to comment on the working draft Scientific Basis Report for Phase II of the update of the Bay-Delta Plan.

Respectfully submitted,

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