

1 STEPHAN C. VOLKER (CSB #63093)  
ALEXIS E. KRIEG (CSB #254548)  
2 STEPHANIE L. CLARKE (CSB #257961)  
JAMEY M.B. VOLKER (CSB #273544)  
3 LAW OFFICES OF STEPHAN C. VOLKER  
1633 University Avenue  
4 Berkeley, California 94703  
Tel: (510) 496-0600  
5 Fax: (510) 845-1255  
Email: svolker@volkerlaw.com  
6 akrieg@volkerlaw.com

7 Attorneys for Protestants Pacific Coast Federation of  
Fishermen’s Associations and Institute for Fisheries Resources  
8

9 **BEFORE THE**  
10 **CALIFORNIA STATE WATER RESOURCES CONTROL BOARD**

11  
12 HEARING IN THE MATTER OF THE  
CALIFORNIA DEPARTMENT OF WATER  
13 RESOURCES AND UNITED STATES  
BUREAU OF RECLAMATION REQUEST  
14 FOR A CHANGE IN POINT OF DIVERSION  
FOR CALIFORNIA WATER FIX  
15

**REBUTTAL TESTIMONY OF NOAH  
OPPENHEIM**

16 I, NOAH OPPENHEIM, do hereby declare:

17 **INTRODUCTION**

18 My name is Noah Oppenheim. I am presenting this testimony on behalf of the Pacific  
19 Coast Federation of Fishermen’s Associations (PCFFA) and the Institute for Fisheries Resources  
20 (IFR) in this evidentiary hearing before the State Water Resources Control Board (State Water  
21 Board) concerning the petition to change the point of diversion for the California WaterFix for  
22 the State Water Project (SWP) and federal Central Valley Project (CVP), as specified in the  
23 licenses and permits of the U.S. Bureau of Reclamation (USBR) and the California Department  
24 of Water Resources (DWR).

25 I have previously testified in this matter. My statement of qualifications is provided in  
26 Exhibit PCFFA-160. I testified in Part 2 regarding Board Questions 3, 3.a, 3.b, 3.d, 4, and 5,  
27  
28

1 addressing the life history of fall- and late-fall run, winter-run, and spring-run Chinook salmon in  
2 the Sacramento river system.

3 My rebuttal testimony covers four topic areas: First, I address erroneous claims made by  
4 DWR witnesses Marin Greenwood and Douglas Rischbieter as they relate to bypass flow criteria  
5 and protection of salmon fisheries beneficial uses: (1) that fall-run Chinook migration and  
6 commercial beneficial uses will be protected; (2) that winter-run Chinook are reasonably  
7 protected by the existing regulatory requirements; (3) that DWR’s proposed salmon survival  
8 targets are sufficient; (4) that DWR’s proposed North Delta Diversion bypass flows are sufficient  
9 to protect salmon survival; and (5) that unlisted salmonids and Pacific Salmon Essential Fish  
10 Habitat will be protected.

11 Second, I address other erroneous claims by Mr. Greenwood regarding the effectiveness  
12 of measures to protect fish. In particular, I rebut Mr. Greenwood’s conclusions regarding fish  
13 screens and the adequacy of Old and Middle River flow criteria to protect fish.

14 Third, I address potential permit conditions. My testimony clarifies PCFFA and IFR’s  
15 position on bypass flow criteria in response to the testimony of DWR witness Marin Greenwood,  
16 California Department of Fish and Wildlife (CDFW) employee Randall Baxter, and Natural  
17 Resources Defense Council (NRDC) witness Jonathan Rosenfield, and suggests additional  
18 conditions to better protect fisheries resources and the Delta ecosystem.

19 Last, my testimony shows that the Collaborative Science and Adaptive Management  
20 Program (CSAMP) model that the project proponents – including DWR witness Gwendolyn  
21 Buchholz – propose for evaluating adaptive management approaches for the WaterFix is  
22 inadequate.

23 **I. REBUTTAL TESTIMONY REGARDING SALMON FISHERIES**

24 **A. FALL RUN, MIGRATION (MIGR) AND COMMERCIAL (COMM)**  
25 **BENEFICIAL USES.**

26 Mr. Rischbieter testified that:

27 The 2006 Delta Water Quality Standards also determined that the water  
28 quality objectives in Table 3 provide reasonable protection of the  
beneficial uses of COMM, as well as the other recreation related beneficial

1 uses which protect and benefit fish and wildlife including EST, COLD,  
2 WARM, MIGR, SPWN, WILD, SHELL, and NAV. (Exhibit SWRCB-  
3 27.)

4 (Exhibit DWR-1024, p. 5:14-18.) He concluded that:

5 Based on modeling output . . . with CWF H3+ in place, the water quality  
6 objectives in Table 3 will continue to be met [and] [t]hus operating CWF  
7 will continue to reasonably protect COMM, EST, COLD, WARM, MIGR,  
8 SPWN, WILD, SHELL, AND NAV beneficial uses.

9 (*Id.*, p. 5:22-25). Mr. Greenwood likewise testified that the fall run Sacramento River Chinook  
10 ESU exhibited an “abundance of the overall ESU demonstrating peaks and troughs over the last  
11 several decades, including a substantial decline in 2007 to 2009.” (Exhibit DWR-1012, p. 31:21-  
12 24.)

13 I strongly disagree with these claims because they are directly contradicted by the  
14 continuing decline in salmon and other fisheries populations since 2006. The experience of  
15 commercial fishermen, coastal communities, and salmon fishery managers in California makes it  
16 abundantly clear that the 1995 and similar 2006 Bay-Delta Water Quality Control Plans have  
17 completely failed to protect the Delta fisheries beneficial uses. After the 2006 Plan was issued,  
18 the salmon fishery continued its precipitous decline, as reflected in the closed and shortened  
19 commercial fishing seasons from 2008-2010 described in Dave Bitts’s Part 2 testimony. (Exhibit  
20 PCFFA-86, p. 5:5-7.) Mr. Greenwood’s testimony does not address the disastrous impacts of the  
21 2013-2016 drought and water operations management on fall run Chinook salmon, leading to  
22 sharply reduced seasons in 2016 and 2017 (Exhibit PCFFA-86, p. 5:8-12) as well as the season  
23 we are now experiencing in 2018, which has been curtailed significantly. As testified by Dave  
24 Bitts, the National Marine Fisheries Service Technical Memo on the 2008 and 2009 fishery  
25 closure cited “[t]he long-standing and ongoing degradation of freshwater and estuarine habitats  
26 and the subsequent heavy reliance on hatchery production” as contributors to collapse of the  
27 stock. (Exhibit PCFFA-86, p. 6:14-16.)

28 Thus, evidence since the 2006 Bay-Delta Water Quality Control Plan was issued shows  
29 that its water quality standards have failed to protect both the migration beneficial use for  
30 Chinook salmon, designated MIGR in that Plan, and the commercial and recreational beneficial  
31 use, designated COMM in that Plan. Mr. Greenwood’s and Mr. Rischbieter’s claims that CWF

H3+ will protect these beneficial uses by maintaining the 2006 Plan’s level of fish “protection” ignore this reality.

**B. STATUS OF WINTER RUN**

Mr. Greenwood refers to Figure B-2, from the National Marine Fisheries Service (NMFS) Biological Opinion (Exhibit SWCB-106, Appendix B, Figure B2 on p. 7, and reproduced below) in his discussion of the status of winter run Chinook salmon (Exhibit DWR-1012, p. 30:4), and later states that winter run are reasonably protected by existing regulatory requirements (Exhibit DWR-1012, p. 34:14). Contrary to Mr. Greenwood’s testimony, Figure B-2 – displayed below – shows that winter run Chinook salmon populations have crashed. I do not consider this to be “reasonable protection.” As David Bitts testified in PCFFA-86, commercial salmon seasons may be restricted – and on some occasions significantly so – by winter run population declines. The marked declines in winter run since 1967 as documented in Figure B-2 confirm that the Delta’s fisheries have been severely mismanaged.

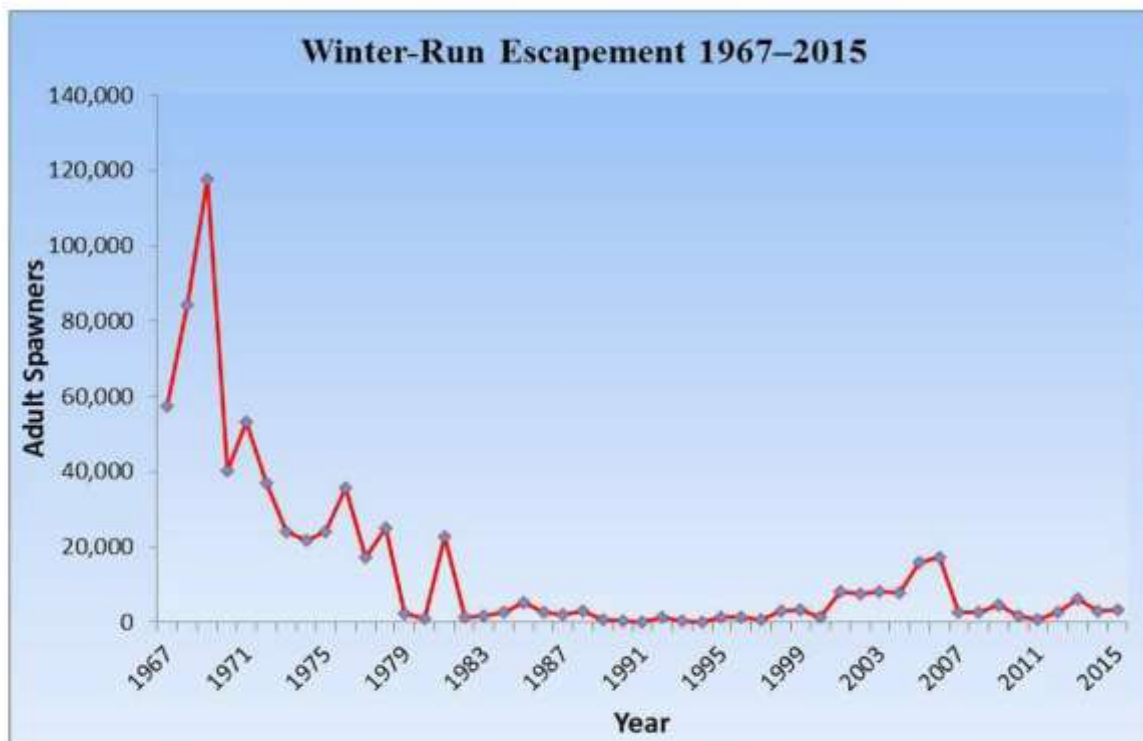


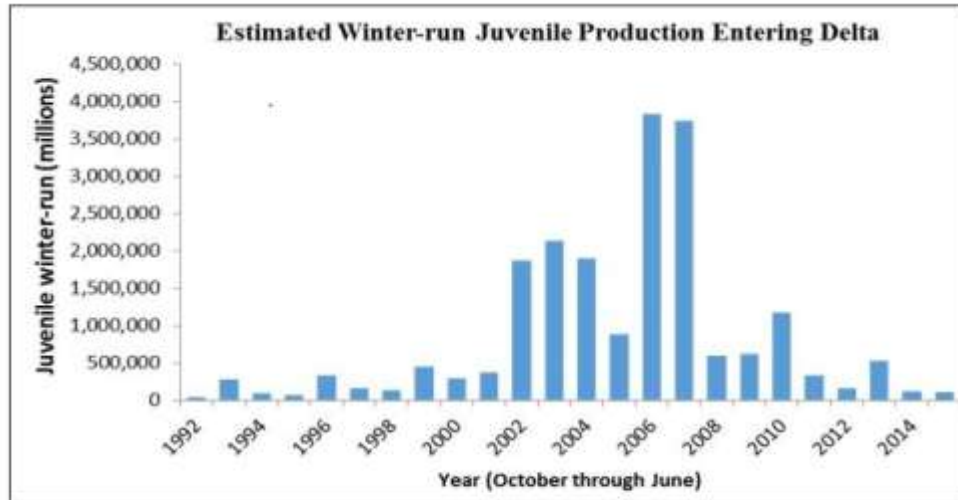
Figure B-2. Winter-run Chinook Salmon Escapement Numbers 1967 to 2015.

Mr. Greenwood also refers to Figure B-4 showing winter run juveniles entering the Delta, displayed below (Exhibit DWR-1012, p. 30 at 6), as evidence that winter run populations have

1 been protected. Again, Mr. Greenwood’s assessment is refuted by the record. Contrary to Mr.  
 2 Greenwood’s testimony, the text of the Biological Opinion states that productivity is *declining*:

3 Productivity, as measured by the number of juveniles entering the Delta,  
 4 or juvenile production estimate (JPE), has declined in recent years from a  
 high of 3.8 million in 2007 to 124,521 in 2015 (Figure B-4).

5 (Exhibit SWRCB-106, Appendix B, p. 13.)



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14 Figure B-4. Winter-run Chinook Salmon Adult and Juvenile Population Estimates Based on  
 15 RBDD Counts (1992 to 2001) and Carcass Counts (2001 to 2015).

16 Figure B-4 clearly shows that the numbers of winter run juveniles entering the Delta have  
 17 declined from nearly 4,000,000 to less than 200,000 fish – a 95% drop – since 2006. For the  
 18 same reasons, existing upstream requirements are also not “reasonably protective” of winter run  
 19 Chinook salmon, and do not protect the spawning beneficial use (SPWN).

20 **C. SURVIVAL TARGETS**

21 Mr. Greenwood’s testimony states:

22 The CWF [Incidental Take Permit (ITP)] requires survival  
 23 following commencement of CWF H3+ operations to be compared  
 24 to pre-operations survival (i.e., a baseline period). The CWF ITP  
 25 (Exhibit SWRCB-107, p. 172) requires that through-Delta survival  
 must be equal to or greater than baseline, ensuring that the CWF  
 H3+ must be operated to provide reasonable protection for juvenile  
 listed salmonids.

26 (Exhibit DWR-1012, p. 42:6-10.)

27 The evidence refutes this claim. As Figures B-2 and B-4 show, both upstream and  
 28 through-Delta survival of winter run Chinook under current conditions are insufficient. In my

1 professional judgment, the proposed baseline study and adaptive management targets will not  
2 remedy hostile conditions for salmon for three reasons: (1) they only consider survival of winter  
3 run in the vicinity of the North Delta intakes – and not upstream or total through-Delta survival,  
4 (2) they apply only to listed runs, and (3) they do not address and will not attain the salmon  
5 doubling requirement for all runs.

#### 6 **D. NORTH DELTA DIVERSION BYPASS FLOWS AND SALMON**

7 Mr. Greenwood’s testimony (Exhibit DWR-1012) acknowledges that the North Delta  
8 Diversion bypass flows analyzed in the NMFS Biological Opinion are insufficiently protective of  
9 winter run Chinook:

10 Overall, the CWF NMFS BO indicated that the CWF potentially could  
11 reduce through-Delta survival, increase travel times, and increase entry  
into the central Delta, where survival is lower.

12 (Exhibit DWR-1012, p. 41;6.) Yet Mr. Greenwood significantly downplays the significance of  
13 this conclusion, claiming that NMFS modeling “potentially overestimate[ed] CWF H3+  
14 operation impacts.” (Exhibit DWR-1012, p. 41:15-17.) Mr. Greenwood’s explanation for why  
15 CWF H3+ operation would be less impactful is based on the assumption that “actual [North  
16 Delta Diversion] pumping levels . . . can [and will] be adjusted” based on fish presence. (*Id.*) As  
17 I testified previously, however, The North Delta Diversion bypass flows are subject to reduction  
18 both in duration and timing under adaptive management (SWRCB-107, Att. 5, pp. 68-69  
19 (“through implementation of the Adaptive Management Program . . . NDD intake operating  
20 criteria and real-time operations may be modified in response to new scientific information and  
21 further evaluation of Project effects such as those related to Old and Middle Rivers, DCC  
22 operations, or north Delta bypass flows”)), which could *increase* the adverse effects of project  
23 operation on salmon. Because fall run and late fall run Chinook salmon may outmigrate at  
24 different times than winter run and spring run, they may experience worse impacts from these  
25 reductions than the ESA protected runs. (See PCFFA-130, p. 10:19-11:3.)

26 Mr. Greenwood’s testimony also refers to “revised real-time operations” in Appendix E  
27 of the NMFS Biological Opinion (Exhibit SWRCB-106.). (Exhibit DWR-1012, pp. 41:22-42:2.)

28 Appendix E of the NMFS Biological Opinion (Exhibit SWRCB-106) refers to an “operational

1 framework” for Unlimited Pulse Protection, not actual proposed real-time operations, as I  
2 explained in my earlier testimony. (PCFFA-130, p. 10:19-11:7.) Experience with the “fisheries  
3 protection plan” mandated by D-1641 has shown that real-time operations to protect salmon may  
4 not even be implemented, as shown in the testimony of Deirdre Des Jardins. (Exhibit PCFFA-  
5 161.)

6 Real-time operations appear to be limited to pulse flows for outmigrating juveniles, thus  
7 leaving bypass flow as the only potential protection for upmigrating adults and any other  
8 organisms that experience flow-dependent population impacts. Notably the July, August and  
9 September minimum bypass flows past the North Delta Diversion are only 5,000 cfs, without  
10 any of the contemplated pulse flows during these months. (DWR-1-143, p.1.) Further such real-  
11 time operations do not include tracking and responding to migration of unlisted salmonids.  
12 (PCFFA-130, p. 11:6-7; Exhibit SWRCB-106, pp. 731-732.) For this reason, PCFFA and IFR  
13 do not support bypass flows triggered only by real time catches of certain juvenile salmon. To  
14 protect the migration and estuarine habitat beneficial use of the Delta, the Board must require  
15 minimum bypass flows in the diversion permit that are protective of the entire fishery.

16 **E. PROTECTION OF UNLISTED SALMONIDS AND PACIFIC SALMON**  
17 **ESSENTIAL FISH HABITAT**

18 Mr. Greenwood’s testimony also states

19 The proposed CWF H3+ avoidance and minimization measures,  
20 conservation measures and recommendations, and operational criteria will  
21 reasonably protect unlisted salmonids and Pacific salmon Essential Fish  
22 Habitat (EFH)

23 (Exhibit DWR-1012, p. 48 at 10.) As explained in detail by Deirdre Des Jardins, the  
24 CWF H3+ operational criteria in the 2017 Biological Opinions are likely to change under  
25 adaptive management. (Exhibit PCFFA-203; see also SWRCB-107, p. 68.) As explained  
26 above, the survival targets for adaptive management appear wholly inadequate even for  
27 listed runs of Sacramento Chinook. The North Delta diversion bypass criteria also only  
28 address the passage of listed runs of Chinook. They do not address the passage of  
unlisted salmonids that are important to commercial fisheries.

In addition, fall-run Chinook adults migrate upstream starting in June, as indicated by Table 3 of the State Water Resources Control Board’s 2010 Delta Flow Criteria Report (Exhibit SWRCB-25, p. 52 (PDF p. 65).) And critically endangered winter-run Chinook may still be migrating to spawning habitat as late as July. (*Id.*)

**Table 3. Generalized Life History Timing of Central Valley Chinook Salmon Runs**

	Migration Period	Peak Migration	Spawning Period	Peak Spawning	Juvenile Emergence Period	Juvenile Stream Residency
<b>Sacramento River Basin Late Fall-Run</b>	October–April	December	Early January–April	February–March	April-June	7-13 months
<b>Winter-Run</b>	December-July	March	Late April-early August	May-June	July-October	5-10 months
<b>Spring-Run</b>	March-September	May- June	Late August-October	Mid-September	November-March	3-15 months
<b>Fall Run</b>	June-December	September-October	Late September-December	October-November	December-March	1-7 months
<b>San Joaquin (Tuolumne River) Fall-Run</b>	October-early January	November	Late October-January	November	December-April	1-5 months

Source: Yoshiyama *et al.* (1998) as cited in Moyle 2002, p. 255.

The table below, from page 11 of DWR-1143 shows the late summer and fall bypass requirements in CWF H3+.

Level I Post-Pulse Operations			Level II Post-Pulse Operations			Level III Post Pulse Operations		
If Sacramento River flow is over...	But not over...	The bypass is...	If Sacramento River flow is over...	But not over...	The bypass is...	If Sacramento River flow is over...	But not over...	The bypass is...
Bypass flow requirements in other months:								
If Sacramento River flow is over...			But not over...			The bypass is...		
<b>Jul-Sep</b>								
0 cfs			5,000 cfs			100% of the amount over 0 cfs		
5,000 cfs			No limit			A minimum of 5,000 cfs		
<b>Oct-Nov</b>								
0 cfs			7,000 cfs			100% of the amount over 0 cfs		
7,000 cfs			No limit			A minimum of 7,000 cfs		

The minimum bypass flows of 5,000 cfs from July to September leave so little water in the river that the flows are tidal in the vicinity of the intakes, which could contribute to stress on upmigrating adults and impair their successful migration. Temperature effects of the reduced flows are also not known, yet upmigrating adults need temperatures below 65 degrees Fahrenheit, as “migration is blocked when temperatures reach 70 [degrees Fahrenheit].” (Exhibit SWRCB-25, p. 48 (PDF p. 61).)



1 My previous testimony also explained that salmon are not growing as expected in the  
 2 Delta. (Exhibit PCFFA-130, 11:13-26.) The State Water Board must mandate sufficient flows  
 3 to sustain zooplankton and avoid large microcystis blooms, protecting the food web in the Delta  
 4 on which all runs depend while rearing in the Delta and outmigrating to San Francisco Bay.

5 The only way for the Board to protect unlisted salmonids and the Pacific Salmon  
 6 Essential Fish Habitat on which they depend is to deny the petition or to include fully protective  
 7 bypass criteria in the permit that are adequate to support both passage of fall run and late fall run  
 8 Chinook salmon, and the entire food web in the Delta on which they rely.

## 9 **II. OTHER MEASURES TO PROTECT FISH NOT PROVEN TO BE EFFECTIVE**

### 10 **A. NO FISH SCREEN STUDIES**

11 Mr. Greenwood's testimony states:

12 Screening the NDD to Delta Smelt and salmonid protection standards (see  
 13 my earlier testimony on Delta Smelt) will provide reasonable protection  
 14 for listed salmonids and sturgeon because the fish will be large enough to  
 15 be effectively screened [citations omitted], but there is uncertainty in the  
 effects of the screens given their length and the fact that field-based  
 studies have not been undertaken of potential effects.

16 (Exhibit DWR-1012, p. 37:1-7.) Mr. Greenwood is mistaken. Since the field-based studies and  
 17 hydraulic modeling called for in the 2013 National Marine Fisheries Service's *2013 Work Plan:  
 18 Intake Design Criteria and Performance Monitoring Development* (Exhibit PCFFA-206) have  
 19 not been conducted (*see* testimony of Deirdre Des Jardins Exhibit PCFFA-203), the effectiveness  
 20 of the proposed screen design and proposed bypass flows cannot be assessed nor can the Board  
 21 presume that they will be sufficiently protective. The FEIR/S is clear that the screening  
 22 technology is experimental and under development. (SWRCB-102, pp. 11-221 to 11-225;  
 23 SWRCB-107, Att. 5, pp. 8, 51-55 (key uncertainties relating to effectiveness of fish screens).)  
 24 In addition, the FEIR/S states that "for most species" "baseline population abundance is not  
 25 known" – and thus DWR's entrainment analysis is modeled from secondary indicators of  
 26 entrainment, such as salvage data. (SWRCB-102, p. 11-221.) Mr. Greenwood's testimony also  
 27 states:  
 28

the CWF H3+ will include a phased testing period prior to full operations in order to evaluate NDD performance across a range of pumping rates and flow conditions, with USFWS, NMFS, and DFW being responsible for evaluating and determining whether the NDD are meeting operational and biological criteria[] and if full operations can commence.

(Exhibit DWR-1012, p. 38:10-14 (footnote omitted).)

Experience with the state and federal fish protective facilities in the South Delta shows that once the diversion facilities are built, they will continue to be operated no matter how ineffective they may be in protecting fish. PCFFA and IFR recommend that the Water Board delay further consideration of the Change Petition until the field-based studies for the North Delta Diversion screens have been done. If the Board nonetheless approves the Change Petition, it must reduce the uncertainty of the effects of the screens by requiring sufficiently large bypass flows during all months of the year.

The Board must also require sweeping flows of at least 0.4 feet per second at the intake screens when diversions are occurring, and approach velocities of no more than 0.2 feet per second, as is assumed in the Biological Opinions and Mr. Greenwood’s testimony. (See testimony of Deirdre Des Jardins (Exhibit PCFFA-203).)

**B. OLD AND MIDDLE RIVER FLOWS**

Mr. Greenwood’s testimony states:

With the implementation of dual conveyance under the CWF H3+, there will be less use of the south Delta export facilities, and therefore there is the potential for entrainment risk to listed salmonids and Green Sturgeon to be reduced from, or at least maintained no more than, the existing levels, which in my opinion are reasonably protective.

(Exhibit DWR-1012, p. 34 at 17.) Mr. Greenwood is mistaken. His opinion is based on the Old and Middle River (OMR) flow criteria in the NMFS Biological Opinion and the ITP, which are summarized in Exhibit DWR-1143, p. 3-5. These criteria are subject to change under adaptive management as noted in footnote 29 of Exhibit DWR-1143. Exhibit PCFFA- 204 shows that South of Delta contractors are already seeking to increase the Old and Middle River flow criteria as part of the Reinitiation of Consultation on Long-Term Operations of the Central Valley Project and State Water Project.

1 The criteria in Exhibit DWR-1143 also fail to comply with the -2500 cfs protective  
2 criteria adopted by the Board's staff in the 2010 Delta Flow Criteria Report, which states in part:

3 Based on the above, the State Water Board determines criteria for net  
4 OMR flows should be [no] greater than -2,500 cfs when salmon are  
5 present in the Delta during the peak juvenile outmigration period of  
6 November through June, for the protection of Chinook salmon.

6 (Exhibit SWRCB-25, p. 124.) The Board's 2010 OMR flow criteria provide critical protection  
7 against entrainment during dry and critically dry years, when populations of winter and spring  
8 run have crashed in recent years. They also provide protection to fall run and late fall run, which  
9 may migrate at different times than winter and spring run.

10 PCFFA and IFR oppose approval of the Change Petition, but if the Board does approve  
11 the Petition, we request that the Board adopt a permit term requiring that net OMR flows be no  
12 more negative than -2500 cfs at the South Delta diversions from November through June.

### 13 **III. OTHER RECOMMENDATIONS**

#### 14 **A. MODIFIED BYPASS AND OUTFLOW RECOMMENDATIONS**

15 In my Part 2 testimony, I recommended minimum bypass flows of 25,000 cfs from April  
16 1 to June 30 in all years, as measured as mean inflow at Freeport and outflow at Rio Vista, and  
17 bypass of storm flows of *at least* 20,000 cfs inflow at Freeport and outflow at Rio Vista from  
18 November through February, bypassed at upstream diversions (PCFFA-130, pp. 13:14-14:21.)  
19 Since that testimony was prepared, however, I have had an opportunity to review more recent  
20 fish survival data, including Perry, R.W., and Pope, A.C., 2018 *Effects of the proposed*  
21 *California WaterFix North Delta Diversion on survival of juvenile Chinook salmon*  
22 *(Oncorhynchus tshawytscha) in the Sacramento-San Joaquin River Delta, northern California*  
23 *U.S. Geological Survey Open-File Report 2018-1078 (PCFFA-207), Michele, et al (2015)*  
24 *(NRDC-40), Perry, et al (2016) (SWRCB-106 Appendix F), and Klimley et al. (2017) (FSL-53),*  
25 *which provide additional evidence of the strong correlation between fish survival and flow. I*  
26 *also reviewed the testimony of NRDC witness Jonathan Rosenfield (NRDC-58 Errata), and the*  
27 *April 11, 2018, testimony of CDFW witness Randall Baxter (R.T. April 11, 2018). Based upon*  
28 *this review and my professional judgment, I must conclude that Dr. Rosenfield's suggested flow*

1 criteria – and my own prior suggested criteria – are insufficient to protect fish. (NRDC-58  
2 Errata, pp. 41:14-43:20.)

3 Dr. Rosenfield’s proposed minimum bypass flow of 35,000 cfs at Freeport from  
4 November 1 to June 1, regardless of fish presence data, and from June 1 to June 30 and October  
5 1 to October 30 *triggered by the presence of Chinook salmon at Knight’s Landing* – still provides  
6 too little protection for fish (NRDC-58 Errata, p. 41:14-26.) “As Dr. Rosenfield admits,  
7 “protect[ing] early and late migrations is critical to maintain the life history diversity that is a  
8 central component of Chinook Salmon success in this watershed.” (*Id.*, p. 41:23-26.) As I  
9 previously testified, juvenile salmon migrate through the Delta starting in August. (PCFF-130,  
10 p. 3:14-15). Indeed, salvage data show that “large juveniles begin to appear at the [CVP and  
11 SWP] pumps in August.” (PCFFA-133, p. 49.) Yet Dr. Rosenfield’s proposal depends upon  
12 adequate monitoring at Knight’s Landing starting in October for these protective bypass flows to  
13 be implemented. Should this Board approve the Change Petition, it must require at least 35,000  
14 minimum bypass flows at Freeport, Rio Vista, and upstream to protect these fish from August  
15 through June

16 In addition, minimum flows in Yolo bypass are also important for outmigrating fry, and  
17 will provide suitable habitat to protect the spawning and early reproduction beneficial use.  
18 PCFFA and IFR request that the Board mandate notching of Fremont Weir to allow passage of  
19 flows at 23,100 cfs, and also implement the minimum flows at Verona shown in Table 4 of my  
20 previous testimony (Exhibit PCFFA-130) from January through May so that Yolo bypass  
21 inundation occurs and provides this essential habitat.

22 Dr. Rosenfield conceded that his testimony might have been “myopically focused on the  
23 Chinook Salmon and the bypass flows on the Smelt” and did not consider flows necessary for  
24 other species. (R.T. April 24, 2018, 181:2-4.) While Dr. Rosenfield testified that “many of the  
25 same effects of WaterFix that are detrimental to Chinook Salmon (e.g., reduced turbidity,  
26 reduced Delta in-, through-, and outflow) will tend to suppress productivity of the estuarine food  
27 web” (NCRD-58 Errata, 23:19-21), his proposed bypass flow criteria was not designed to  
28

1 address these food-web impacts, or to benefit species other than salmon. (NRDC-58 Errata, pp.  
2 41:14-43:20; R.T. April 24, 2018, 179:3-181:25.)

3 ~~Yet DWR's Final Environmental Impact Report/Statement (FEIR/S) indicates that~~  
4 ~~numerous other fish species are likely to be in the vicinity of the proposed North Delta~~  
5 ~~Diversions throughout the year, including Delta smelt (SWRCB-102, p. 11A-3 to 11A-5),~~  
6 ~~Longfin smelt (*id.*, pp. 11A-30 to 11A-32), Sacramento splittail (*id.*, p. 11A-146), white sturgeon~~  
7 ~~(*id.*, p. 11A-178), Pacific lamprey (*id.*, pp. 11A-191 to 11A-192), and river lamprey (*id.*, pp.~~  
8 ~~11A-198 to 11A-199). The FEIR/S also indicates that green sturgeon (*id.*, p. 11A-162) and~~  
9 ~~Central Valley steelhead (*id.*, pp. 11A-129 to 11A-130) are likely to be in the vicinity of the~~  
10 ~~North Delta Diversion for significant portions of the year. Many of these species are not listed,~~  
11 ~~but are public trust resources. As of now, DWR has failed to provide adequate evidence that~~  
12 ~~these resources, including their food sources, will be protected if the Change Petition is granted.~~  
13 Based upon the April 11, 2018 testimony of Mr. Baxter discussing the regime shift in the Delta  
14 ecosystem (R.T. April 11, 2018, pp. 20:1-26:15), I conclude that increased outflows are  
15 necessary to restore the ecosystem and essential fish habitat. Indeed, any bypass flow criteria  
16 must be sufficient to protect all these important aspects of the Delta ecosystem, including the  
17 food web.

18 DWR witness Mr. Greenwood's testified that:

19 The FEIR/S included analysis of potential effects to unlisted fishes  
20 proposed for incidental take coverage *under Habitat Conservation Plan*  
21 *(HCP) alternatives*, i.e., White Sturgeon, Sacramento Splittail, and Pacific  
22 and River Lamprey, as well as other aquatic species of primary  
management concern which were assessed to be important native species  
(Sacramento Tule Perch) or to have economic importance (i.e., Striped  
Bass, American Shad, Largemouth Bass, Threadfin Shad, and Bay  
Shrimp).

23 (Exhibit DWR-1012, p. 50:24-51:10, emphasis added.)

24 Mr. Greenwood is again mistaken. The FEIR/S assumed that the previously proposed  
25 Habitat Conservation Plan – the Bay-Delta Conservation Plan – would be in effect. It won't. It  
26 is no longer part of the WaterFix; only a Section 7 ESA consultation and a Section 2081 CESA  
27 consultation have been undertaken. The CWF H3+ Spring outflow criteria, proposed to protect  
28 Longfin smelt, also may not be implemented. (DWR-1143, p. 6, Footnote 39.) Yet DWR has

1 not analyzed the impacts of the project on starry flounder and Bay shrimp, among others, without  
2 the spring outflow criteria.

3 Based on my professional judgment, PCFFA and IFR recommend Enhanced Delta  
4 outflow of 75% of unimpaired flow from December to June in order to protect Bay species and  
5 estuarine habitat, consistent with the best available science. (SWRCB-25, pp.5, 99 (PDF p. 111);  
6 R.T. April 11, 2018, 40:4, 45, 2) Delta outflows of 75% of unimpaired flows would not only  
7 protect Longfin smelt, they would protect other San Francisco Bay species that use brackish  
8 water habitat, including starry flounder and Bay shrimp. (SWRCB-25, pp. 99-108 (PDF pp. 111-  
9 121).) Indeed, CDFW biologist Randall Baxter testified in Part 2 that increases in starry  
10 flounder and Bay shrimp abundance are correlated with very high outflows, and that each  
11 requires brackish water habitats that “are expanded in high flow years.” (R.T. April 11, 2018,  
12 43:6-21, 44:22 to 45:2.) This testimony is consistent with the 2010 Delta Flow Criteria Report,  
13 which sets a biological goal to “[c]reate shallow brackish water habitat . . . in Suisun Bay (and  
14 farther downstream)” for these species. (SWRCB-25, pp. 43, 82-84 (PDF pp. 52, 95-97).)

15 In addition, in extremely dry months with little snowpack, 75% of unimpaired Delta  
16 outflow may be insufficient to protect salmon, and 55% of Delta outflow (as proposed in the  
17 Bay-Delta Water Quality Plan update) almost certainly will be insufficient. Therefore PCFFA  
18 and IFR recommend that the Board include stringent minimum bypass criteria for inflows at  
19 Freeport and outflows at Rio Vista to protect passage of Chinook salmon, as I testified  
20 previously. Only with increased year-round outflows can the Delta ecosystem have any chance  
21 of avoiding complete collapse.

22 **B. 2010 BIOLOGICAL GOALS AND OBJECTIVES**

23 Based on my professional judgment, I recommend that the Board require as a permit  
24 term, that the SWP and CVP be managed to meet the specific biological goals recommended to  
25 the Board by the then-called Department of Fish and Game (DFG) in 2010, as required by  
26 Water Code section 85084.5:<sup>1</sup>

27  
28 <sup>1</sup> Water Code section 85084.5 states:

1 *Chinook salmon*

2 • For the San Joaquin River basin, provide sufficient water flow depending on year type  
3 to transport salmon smolts through the Delta in order to contribute to the attainment of  
4 the salmon protection water quality objective of doubling the natural production of  
5 Chinook salmon from the average production of 1967-1991.

6 • For the Sacramento River basin, provide sufficient water flow to transport salmon  
7 smolts through the Delta in order to contribute to the attainment of the salmon protection  
8 water quality objective of doubling the natural production of Chinook salmon from the  
9 average production of 1967-1991.

10 • For eastside streams that flow to the Delta including the Mokelumne and  
11 Cosumnes River basins, provide sufficient water flow to transport salmon smolts through  
12 the Delta in order to contribute to the attainment of the salmon protection water quality  
13 objective of doubling the natural production of Chinook salmon from the average  
14 production of 1967-1991.

15 • For mainstem rivers that flow into the Delta and their tributaries, maintain water  
16 temperatures and dissolved oxygen at levels that will support adult migration, egg  
17 incubation, smolting, and early-year and late-year juvenile rearing at levels that facilitate  
18 attainment of specified life-history stage production goals.

19 *Starry Flounder*

20 • Depending on year type, provide sufficient water flow to increase abundance of starry  
21 flounder to pre-1987 abundance levels.

22 *Zooplankton*

23 • Provide low salinity habitat for zooplankton in Suisun Bay (and farther downstream) by  
24 maintaining X<sub>2</sub> between 64 km and 75 km between January and June.

25 (*Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of*  
26 *Concern Dependent on the Delta*, DFG 2010 (Exhibit SWRCB-66, p.2).) These biological goals  
27 are essential to protecting the Delta ecosystem from the North Delta Diversions.

28 **C. MONITORING**

~~The FEIR/S, NMFS Biological Opinion, and ITP contemplate ongoing fish presence  
monitoring. The NMFS Biological Opinion states that locations for monitoring for unlimited~~

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The Department of Fish and Game, in consultation with the United States Fish and Wildlife Service and the National Marine Fisheries Service and based on the best available science, shall develop and recommend to the board Delta flow criteria and quantifiable biological objectives for aquatic and terrestrial species of concern dependent on the Delta. The recommendations shall be developed no later than 12 months after the date of enactment of this division.

1 ~~pulse protection are unknown. (Exhibit SWRCB-106, p. 731-732.) The ITP refers to a~~  
2 ~~monitoring station at Knights Landing, upstream of the Feather and American Rivers (SWRCB~~  
3 ~~107, p. 191.) While the ITP has vague references to funding “subsequent fish and water quality~~  
4 ~~monitoring stations” (SWRCB-107), no specifics are provided.~~

5 Collection and reporting of screw trap data for salvage fish, analyzed for length at date,  
6 should be mandated by the State Water Board at long-term CVPIA Comprehensive Assessment  
7 and Monitoring Program (“CAMP”) stations on tributaries to the Delta, including Knights  
8 Landing on the Sacramento River, at Watt Avenue on the American River, in the high flow and  
9 low flow channels of the Feather River, and on the Cosumnes and Mokelumne River.<sup>2</sup> (Exhibit  
10 PCFFA-208, p. 4-9.) The State Water Board must require data collection year round, and  
11 reporting for all runs. The Board should also mandate the reporting of raw salvage numbers and  
12 length at date charts for the SWP and CVP fish protection facilities at the Delta pumping plants.

#### 13 **IV. ADAPTIVE MANAGEMENT**

14 DWR witness Gwendolyn Buchholz testified that DWR and other agencies “will  
15 coordinate with collaborative science workgroups to identify and prioritize potential changes to  
16 address uncertainties related to the effects of SWP and CVP operations” though adaptive  
17 management. (Exhibit DWR-1010, p. 8:18-22). Exhibit DWR-117, *Adaptive Management*  
18 *Framework for the California Water Fix and Current Biological Opinions on the coordinated*  
19 *operations of the Central Valley and State Water Projects*, presents an outline for an Adaptive  
20 Management Framework (“framework”) that relies upon other examples of adaptive  
21 management approaches in the Delta and elsewhere. One such example in the framework is the  
22 Collaborative Science and Adaptive Management Program (CSAMP). I have been a member of  
23 the CSAMP Policy Group, the highest tier of the hierarchical CSAMP-CAMT program  
24 described in detail in DWR-117, since March 13, 2017. (See LAND-268, slide 25 (member  
25 list).)

26  
27  
28 <sup>22</sup> (Exhibit PCFFA-208 is a true and correct copy of U.S. Fish and Wildlife Service, A  
Catalog Of Rotary Screw Traps That Have Been Operated In The Central Valley Of California  
Since 1992.)



1 According to DWR-117, “Adaptive Management” is defined in California Water Code  
2 section 85052 as “a framework and flexible decision making process for ongoing knowledge  
3 acquisition, monitoring, and evaluation leading to continuous improvement in management  
4 planning and implementation of a project to **achieve specified objectives.**” (*Id.*, emphasis mine;  
5 see also SWRCB-107, Att. 5.) The presumption of adaptive management is that objectives are  
6 not poorly defined or undefined, nor are they “subject to uncertainty” as stated in DWR-117.  
7 However, DWR claims in the framework that “. . . the CSAMP, in coordination with the IICG, is  
8 the venue in which to collaboratively define management relevant problems, establish objectives,  
9 define potential available alternatives, and clearly define the remaining uncertainty and research  
10 needs.” This statement runs counter to established processes for adaptive management, whereby  
11 objectives (in this case, protection of listed salmonids and beneficial uses) are prescriptive. The  
12 framework does not contain or enumerate management objectives, contrary to the definition of  
13 adaptive management in the California Water Code.

14 Having devoted significant amounts of time to the CSAMP process, it is my experience  
15 and professional judgment that DWR’s proposed framework is not the appropriate model upon  
16 which to base an adaptive management program for the proposed project, nor should it be used  
17 to “establish objectives” for adaptive management. CSAMP does not have voting procedures nor  
18 does its structure allow for decision making on such foundational aspects of adaptive  
19 management as determining objectives. Such an approach is recursive (circular) and  
20 tautological, likely resulting in the co-option of the process by whomever is participating in the  
21 process. In the case of the proposed Adaptive Management framework, the participants are the  
22 ‘Five Agencies’ and project beneficiaries (SWRCB-107, Att. 5, p. 10); the likely outcome of the  
23 framework would be the establishment of objectives that are insufficiently protective of public  
24 trust resources. Therefore, the Board should not include an adaptive management program that  
25 relies on DWR’s framework nor should it approve a permit that contains any adaptive  
26 management program that is not based on firm and established objectives for the protection of  
27 public trust resources, including unlisted and listed salmonids.

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**CONCLUSION**

Based on this testimony, it is clear that the Water Board must deny the Change Petition in order to protect the beneficial use of commercial salmon fishing, preserve the public trust, and minimize unreasonable impacts to fish and wildlife.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I executed this declaration on July 13, 2018 in San Francisco, California.



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NOAH OPPENHEIM