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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 WATERFIX	**PREPARED DIRECT TESTIMONY OF DR. FRASER SHILLING ON BEHALF OF THE ENVIRONMENTAL JUSTICE COALITION FOR WATER**

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I, Fraser Shilling, do hereby declare:

I. INTRODUCTION

1. The purpose of my prepared direct testimony is to provide my opinion about the potential and likely impacts of the WaterFix project on procedural and material aspects of environmental justice, as it relates to California Indian Tribes and local communities and their use of fish in the Delta region.

2. I have reviewed the testimony and materials submitted by Petitioners California Department of Water Resources and United States Bureau of Reclamation, as well as the scientific and technical literature.

3. My educational, teaching and research experience has been varied, providing me with the breadth and depth necessary to respond to several aspects of this project. My doctoral training was at the University of Southern California in the Biological Sciences Division (Ph.D., 1992). My research focused on the physiological ecology of marine organisms faced with varying nutritional, thermal, and life-stage conditions. My research since beginning work at the University of California, Davis (1995) and especially since joining the Department of Environmental Science and Policy (2000), has focused on the use of information about environmental, infrastructural, and social conditions in making better management and policy decisions. In the last 15 years, I have focused my research on water quality and quantity conditions in waterways, social uses of fisheries in the Delta and throughout California, and impacts of transportation infrastructure on fish and wildlife. In that period, I have collaborated with multiple local, state and federal organizations, including: Placer, Nevada, and Sonoma Land Trusts; Napa and El Dorado Counties; South Yuba River Citizens League; Sacramento River Watershed Program; Los Angeles San Gabriel Rivers Watershed Council; Almond Board of California; California Departments of Water Resources, Conservation, Transportation, Fish and Wildlife, Forestry and Fire Protection; State Water Resources Control Board; USDA Forest Service; US Department of Transportation; and US Environmental Protection Agency.

4. I will address the potential impacts of the project construction and operation on the ability of Delta region Tribes and communities to enjoy fishing and fish consumption in a way protected

by SWRCB-promulgated beneficial uses. The project will cause un-mitigated impacts on mercury content of fish used in the Delta region and tributaries by angling communities. The project may also reduce the availability of fish to Tribes and other communities who depend on fish populations in the Delta region for subsistence needs. My testimony will address how the potential negative impacts of the Delta Tunnels project ("a.k.a. WaterFix") would not be in the public interest because of broad, un-mitigated effects on fishing, fish consumption and fish contamination via possible impacts on fish populations and fish-tissue mercury burdens.

II. SUMMARY OF TESTIMONY

5. The changes proposed in the Petition will unreasonably affect fish, recreational, and public trust uses in the Delta region through decreased tribal, recreational-angling, and subsistence beneficial uses of fish. This is based on likely impacts on fish availability and quality.

III. PROCEDURAL ENVIRONMENTAL JUSTICE

6. Environmental justice is based upon three domains of justice sought by environmental justice advocates: distributive, procedural, and recognition (EJCW-3: Scholsberg, 2004). These ideas have been embedded in federal and state law through statute and executive order: "Layered on top of Title VI of the Civil Rights Act and President Clinton's 1994 Executive Order (#12898), California's SB 115 (Solis D-El Monte) and SB 89 (Escutia D-Montebello) passed just prior to the signing of [the CALFED/Bay-Delta] ROD (in 1999 and 2000 respectively) obligate the California Environmental Protection Agency to institute a range of efforts to incorporate environmental justice" (EJCW-4: Shilling et al., 2009a). Although having a thorough knowledge of the various statutes and policies relating to environmental justice (EJCW-5: FEIR Chapter 28), many years after the signing of the first Bay-Delta Record of Decision, WaterFix planners have still not managed to incorporate even the most basic level of procedural environmental justice in that low-income communities and communities of color are not included as participants and figures of authority in decision-making. Instead, their participation is through "outreach" (EJCW-5: FEIR Chapter 28), to discover cultural and other practices potentially impacted by a project decided by others in a place of privilege (EJW-3: Schlosberg et al., 2004; EJCW-4:

Shilling et al., 2009a). This includes subsistence fishing, arguably the most important material environmental issue for some communities, where WaterFix describes brief outreach processes in the early 2000s, a few key informant interviews, and a single study of fish consumption conducted in one clinic in Stockton (EJCW-6: Silver et al., 2007) as the basis for their evaluation of environmental justice issues related to consumption of fish caught in the Delta and its nearby tributaries (EJCW-5: FEIR, Chapter 28, pp. 28-6 to 28-8).

7. An important aspect of sustainability is that affected parties are included in development of programs and projects that could impact them. This is especially true for California Tribes, which must be consulted by state agencies engaged in actions that could impact Tribes. At least two California Tribes use the Delta in traditional and subsistence ways that are protected by the Beneficial Uses recently promulgated by SWRCB – CUL and T-SUB. During a SWRCB-sponsored project that I led, members of the Me-Wuk Tribe in Sacramento (Buena Vista Rancheria) and Miwok Tribe in Wilton and Elk Grove reported to me that they used Delta waterways for fishing (EJCW-7: Shilling et al., 2014). In contrast to this current use, the premise of the California Tribes' participation in the WaterFix is that it is covered by the Programmatic Agreement (PA), which primarily focuses on historical/archaeological features that the PA would cover. However, Tribes currently use the Delta in a decidedly non-historical way, relying on the ability to catch fish and use other Delta features protected by CUL and T-SUB. This suggests that consultation on these protected beneficial uses has not taken place (EJCW-5: FEIR Chapter 28) and there is no current requirement for them to take place. According to the WaterFix 404 application to USACE: "USACE, in collaboration with DWR, is developing a draft Section 106 PA for the conveyance facility. The PA provides for the identification of historic properties within the Area of Potential Effect (APE) of the selected Project alternative prior to construction initiation, and the development of avoidance, protection, or mitigation measures for those historic properties that could be adversely affected by the Project. Treatment plans will be prepared to address impacts to NRHP-eligible archaeological, built environment, and Traditional Cultural Property (TCP) resources within the APE. The PA details how many of the day-to-day responsibilities for Section 106 compliance are delegated to DWR by USACE. Participation in the Section 106 process by Native American Tribes or individuals with an ancestral affiliation with the Project area is described in the PA. Native Americans will be

invited to participate in the development and implementation of the terms of the PA, including inventory reports, evaluation plans and reports, and during the resolution of adverse effects through the development of treatment plans for those resources within the APE that are either exclusively or partially affiliated with prehistoric or ethnographic resources. Participation may take place during public meetings, at meetings organized only for Native American Tribes as a group, or at meetings with single Tribes or individuals; meetings may be informal or may be identified as formal government-to-government consultations, depending on the participants involved. Native American Tribes, both federally recognized and those without federal recognition, and with individuals with a demonstrated ancestral tie to the project area will be invited to be concurring parties to the PA. However, these entities are not required to be concurring parties in order to participate in the processes described in the PA, and they may request to become concurring parties at any time during the process." (EJCW-8: USACE 404 permit application, p 30) In addition, WaterFix describes the primary environmental justice impacts to Native Americans to be via significant and unavoidable impacts to archaeological sites (EJCW-5: FEIR Chapter 28, pp. 28-79 to 28-81), rather than to currently-used cultural resources and fishing, protected by recently promulgated beneficial uses CUL and T-SUB.

8. It is my opinion, based on the foregoing, that WaterFix project proponents have failed to consider the involvement in decision-making of Tribes and communities with an interest in subsistence use of the Delta or impacted tributaries. This is in violation of various State and federal rules governing consultation and participation of disadvantaged communities and Tribes in decisions that impact them.

IV. IMPACTS TO EDIBLE FISH AVAILABILITY

9. During a study of fishing and fish consumption in the Delta region (EJCW-9: Shilling et al., 2010), I interviewed anglers throughout the area planned for the CWF intakes (see Figure 1 below). They were primarily immigrants from SE Asia and Eastern Europe (e.g., Ukraine), but also included US born people of a variety of ethnicities. Many anglers interviewed consumed several ounces of fish per day (95th percentile rate of consumption for all anglers = 127 g/day) and estimated mean mercury intake from fish consumption (11.4 g/day) was well above the USEPA-recommended maximum of 7 g/day. According to anglers I interviewed, the river curves immediately north and adjacent to the proposed WaterFix intakes were particularly popular with anglers because of high likelihood of catching large sturgeon and striped bass (for example, the Clarksburg Boat Launch, Figure 2). They reported that this was because of the depth of the river at that point.

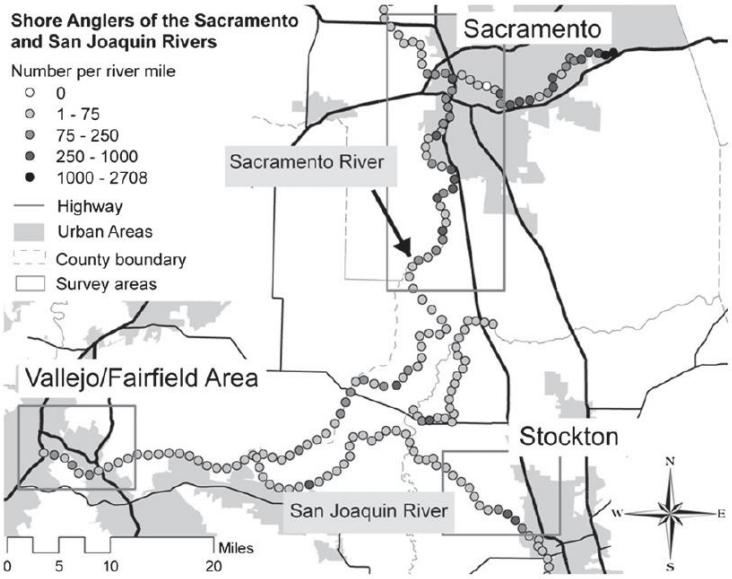


Figure 1. Annual fishing activity in Delta region, Shilling et al. (2010).

Figure 2. Location of Clarksburg Boat Ramp on map showing proposed locations of N Delta intakes.

10. Besides the impacts of operating the intakes to remove water from the river, including at low flows, constructing and operating the intakes will remove this important site of subsistence fishing. This will negatively impact beneficial uses T-Sub and SUB.

IV. IMPACTS TO EDIBLE FISH QUALITY

11. Beside the likely disruption of the acts of subsistence fishing and subsistence fish consumption, it is likely that WaterFix operations will change the quality of the fish, in terms of potential for increased mercury in fish tissue and harmful algal blooms (HABs). Both effects negatively impact the beneficial uses T-SUB and SUB, recently promulgated by the SWRCB to protect subsistence fishing. Dr. Michael Brett (University of Washington) makes clear in sur-rebuttal testimony that HABs may form as a result of a combination of reduced flows, nutrient conditions, and increased residence time (EJCW-10: Sur-Rebuttal MBrett), which may be harmful to the SUB beneficial use. In addition, with increased water temperatures, both mercury methylation and entry into the food chain and HABs become more likely (EJCW-11: Dijkstra et al., 2013). For example, Dijsktra et al. (2013) demonstrated that in estuarine conditions, increasing water temperatures from 19^{o}C to 22^{o}C resulted in a tripling in fish tissue mercury concentrations. This means that even with small changes in river water temperature caused by CWF operations there could be very large changes in fish tissue mercury, which would be harmful to local, recreational, and subsistence anglers and their families and to wildlife (birds,

mammals) consuming fish. The problem is that the changes may not be small. Modeling of water temperatures suggest that temperatures above 20^{o}C are predictable during critically dry years, which will be exacerbated by water extraction and when there will be the most pressure to operate the CWF intakes (EJCW-12: DFW_Incidental_Take_Permit Attachment 7 – Modeling). In drought conditions and under the preferred alternative, releases from Folsom to lower American River and then to the Sacramento River/Delta would be as high as 70F (page 5.C-18); >70F at Knights Landing (June-Sept (Figure 5.C.7-10-1); mid-high 70s at Knights Landing in critical years (Figure 5.C.7-10-6); mid-high 70s in Feather River high flow channel below Thermalito afterbay in dry and critical years (Figure 5.C.7-13-6); 70F for American River below Hazel in critical years (Figure 5.C.7-14-6); 70-80F in critical years for American River at Watt, (Figure 5.C.7-15-6); and mid-70s to low-80s in critical years for the American River at the Sacramento River confluence (Figure 5.C.7-16-6).

12. An important question then is whether or not such seemingly small and thus harmless changes in water temperature caused by the proposed project are actually harmless, or could predictably cause harm to public trust resources and protected beneficial uses. WaterFix uses a standard for impacts for beneficial use of Aquatic Life, disregarding the fish-consumption related uses: "It should be noted that because aquatic life beneficial uses are the only uses expected to be affected by temperature changes under the various alternatives, the water quality chapter cross-references to Chapter 11, *Fish and Aquatic Resources*, for all impact assessments for temperature." (EJCW-13: FEIR/S Chapter 8, p. 8-138)

13. Although the modeling of water temperature suggests that there will be no statistically significant effect on water temperature of the water withdrawals (EJCW-12: DFW_Incidental_Take_Permit Attachment 7 – Modeling, App 5.C Upstream Water Temperature Methods and Results), this finding may be because of how the modeling and statistical significance was carried out. For example, in App 5.C Water Temp 5.C.5.1 Absolute vs. Relative Use of the Model Results, the authors state: **"**The models are not predictive models of actual operations and resulting temperatures (in the way they are applied in this study), and therefore the results cannot be considered as absolute with and within a quantifiable confidence interval unless the hypothetical storages and assumed uniform release rates were to occur." (page 5.C-7) This statement suggests that even if the model seems precise in its predictions, it is not necessarily accurate in terms of how river temperature conditions could be affected by

operations. In addition, section 5.C.5.2 Appropriate Reporting Time-Step suggests that changes in water temperature could be caused by CWF operation at less than monthly time intervals: "Since the temperature models are driven by the long term hypothetical operations simulated in CalSim II on a monthly time step, typically the temperature results are presented on a monthly time step from both HEC5Q and the Reclamation Temperature Model. Monthly flow and temperature results are unlikely to address the daily variability in the river temperatures, but reflect changes in the monthly means." (page 5.C-7) In addition, comparisons between No Action Alternative and the Preferred Alternative showed no apparent statistically-significant difference between NAA and PA in terms of monthly average temperatures. However, one of the many reasons there is no difference is that the temperature ranges within months are so large due to daily and weekly variation. This does not mean that biologically-meaningful differences in daily temperatures won't exist, such as instantaneous and short-term exceedances of harmful or lethal temperatures for young, cold-water dependent fish, harmful algal blooms, and rapid growth of mercury-methylating microbes. For example, temperatures could peak in the 70s during the day, resulting in a rapid increase in mercury-methylation, then dip only a few degrees, reducing mercury-methylation and resulting in an apparent harmless mean of 70 F or slightly less. However, the methylated mercury will be bioaccumulated regardless of the slightly cooler temperatures. Concentrations of mercury and methylmercury upstream of the Delta will not be substantially different relative to Existing Conditions due to the lack of important relationships between mercury/methylmercury concentrations and flow for the major rivers. (EJCW-13: FEIR/S Chapter 8, p. 8-526)

14. The dynamics of microbial mercury methylation and demethylation in situ does not depend on average conditions (EJCW-14: Creswell et al., 2017), nor is the rate of mercury gain into aquatic organisms the same as mercury loss, which contributes to bioaccumulation and biomagnification. For example, Wang et al. (EJCW-15: Wang et al., 2013) showed that freshwater fish accumulated methyl-mercury during feeding and transported and retained the methyl-mercury through transfer from the liver to the muscle during 2 months of depuration (forced non-feeding/starvation).

15. The WaterFix modeling for mercury bioaccumulation centered on largemouth bass because: “Largemouth bass were chosen for this analysis because they are popular sport fish, top predators, live for several years, and tend to stay in the same area (that is, they exhibit high site fidelity). Consequently, they are excellent indicators of long-term average mercury exposure, risk, and spatial pattern for both ecological and human health.” (EJCW-19: FEIR/S Chapter 8, Appendix 81, p. 81.2) At the same time, Appendix 81 makes clear that the model is imprecise and not necessarily accurate for a variety of reasons associated with variability and uncertainty in mercury and methyl-mercury availability. This probably contributed to the lack of an apparent difference among alternatives across various Delta sites affected by WaterFix and the finding of an inconsiderable impact of Alternative 4A on mercury concentrations in fish (EJCW13: FEIR/S Chapter 8, p.8-1). In reality and based on the approach WaterFix took, there is no way to know, but in almost all alternatives, mercury in fish tissue increases, suggesting that it is a likely impact.

16. Most disturbingly, WaterFix finds that increases of 9-15% (with unknown variation around these values) in fish tissue mercury are possible in various Delta waterways, but these are considered to be “small” increases and are “not expected to result in changes to beneficial use.” (EJCW-13: FEIR/S Chapter 8, p.8-525) This idea is expanded upon in the environmental justice chapter (EJCW-5: FEIR Chapter 28), which describes the potential health impacts from eating fish containing mercury as adverse, significant and unavoidable (EJCW-5: FEIR Chapter 28, pp. 28-84-to +28-87). Because WaterFix takes the position that Alternative 4A will cause no considerable additional mercury burden in fish and thus public health impact, they aver that there is thus no additional environmental justice impact from the preferred alternative (EJCW-5: FEIR Chapter 28).

17. It is my opinion, based on the foregoing, that there will very likely be an increase in mercury in edible fish in the Delta caused by water diversion operation of the WaterFix project. This will cause adverse health impacts on subsistence fishers from low income communities, communities of color, and Tribes. Therefore, there are both avoidable environmental justice impacts and avoidable impacts to 3 beneficial uses: T-SUB, CUL, and SUB.

V. IMPACTS TO TRIBES' SUBSISTENCE USE OF FISH

18. The water rights of the SWP and CVP are conditioned by the State Water Board to protect the beneficial uses of water within the Delta under each respective project's water rights. (EJCW-8: USACE 404 permit application p 10.) The premise of the Native American participation is covered by the PA, which primarily focuses on historical/archaeological features that the PA would cover. However, Tribes currently use the Delta in a decidedly non-historical way, relying on the ability to catch fish and use other Delta features protected by CUL and T-SUB. This is discussed in terms of procedural concerns in sections above of this testimony. Changes in fish availability, fish quality, perceived fish quality, and perceived water quality in the ways described in preceding sections could all substantially harm California Tribes using the Delta and its immediate tributaries in ways protected by Beneficial Uses T-SUB and CUL.

19. It is my opinion, based on the foregoing, that Tribes currently using the Delta and tributaries for subsistence and traditional ways would be adversely impacted by operation of WaterFix. This harm will occur through lack of tribal participation in the decision-making process, perceived and actual changes in fish availability, and perceived and actual changes in fish quality. Beneficial uses T-SUB and CUL would be negatively impacted by the preferred alternative.

V. IMPACTS TO COMMUNITIES' SUBSISTENCE USE OF FISH

20. Besides California Tribe uses of Delta waters and fish, many people from Delta communities use fish as a public trust resource with various intensities. In 2016, there were sales of 144,775 annual/lifetime freshwater licenses and 34,970 day licenses in Sacramento, San Joaquin, Solano, and Yolo counties (CDFW License Bureau, accessed 11/5/2017; https://www.wildlife.ca.gov/Licensing/Statistics) Because people tend to fish near home, this suggests that over 100,000 people frequently fished in 2016 in counties ringing the Delta, which is similar to the situation 10 years ago (EJCW-16: Shilling, 2004; EJCW-17: Shilling 2009b).

21. Although there have been no recent surveys of fishing, fish-use, and fish consumption in the Delta region, assuming the rates now are similar to 2007-2009, approximately 10% of anglers and their families ingest more than 10 times the recommended maximum amount of mercury through fish consumption.

22. There are two important facets of the recreational and subsistence fishing activities of people living in communities around the Bay-Delta. One is that they depend on the presence of fish populations for cultural, dietary, and economic reasons. The other is that modifications of water management in the Sacramento River and Delta could increase the mercury content of edible fish relied upon by subsistence fishing populations, as detailed in the sections above. Subsistence use is protected by beneficial use SUB. Subsistence fishing and specifically use of inland fish to meet subsistence needs is recognized globally as a resource at risk and in need of protection to protect dependent human populations and their human right to food (EJCW-18: Youn et al., 2014; EJCW-19: Lynch et al., 2017).

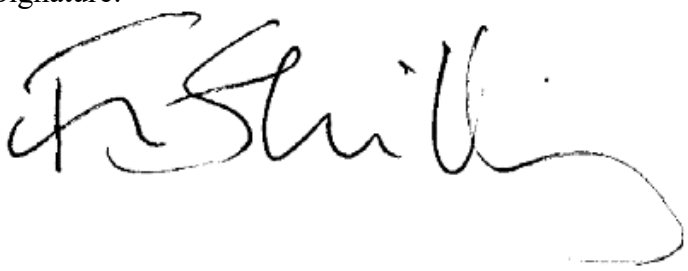
23. It is my opinion, based on the foregoing, that the act of fishing and availability of fish for recreational and subsistence fishing would be adversely impacted by the preferred alternative.

VI. CONCLUSION

24. In conclusion, it is my professional opinion that there are substantial, unrecognized and un-mitigated impacts of the WaterFix preferred alternative on material and procedural environmental justice issues in and around the Delta.

I declare that the foregoing is true and correct. Thank you for the opportunity to present this testimony.

Signature:



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Date: November 30, 2017

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