EXHIBIT ARWA-700

TESTIMONY OF PAUL BRATOVICH

1. I am a fisheries biologist employed by the firm of HDR, Inc. I hold a Bachelor of Science degree in Fisheries from the University of Washington, located in Seattle, Washington, and a Master of Science degree in Fishery Resources from the University of Idaho, located in Moscow, Idaho. A copy of my resume, which accurately describes my education and experience, is **Exhibit ARWA-701**.

2. **Exhibit ARWA-501** is a joint PowerPoint presentation that summarizes key points of my testimony. Exhibit ARWA-501 represents the "summary of testimony" requested by the SWRCB.

3. I have over 35 years of experience as a fisheries biologist in the State of California. Most of that experience has focused on conducting studies on anadromous salmonids in the Central Valley of California. I have actively conducted studies and performed evaluations on steelhead and fall-run Chinook salmon in the lower American River since 1984.

4. For the 2000 environmental impact report for the Water Forum Agreement, I developed the impact analysis framework, conducted hydrologic and water temperature model output analyses, and prepared the fisheries and aquatic resources impact analysis. I was responsible for fisheries considerations in the development of a 2006 flow management standard (FMS) for the lower American River that the National Marine Fisheries Service (NMFS) largely adopted in its 2009 Biological Opinion (BO) for the operations of the Central Valley Project (CVP) and the State Water Project (SWP). My involvement in the development of the 2006 FMS focused on biological justification and rationale for that flow standard, including flow and water temperature considerations.

5. My testimony addresses two subjects: (A) the water temperature-related effects of California WaterFix on steelhead in the lower American River; and (B) biological support for the Lower American River Modified Flow Management Standard (Modified FMS).

SUBJECT 1: EFFECT OF CALIFORNIA WATERFIX ON LOWER AMERICAN RIVER STEELHEAD

Review of the NMFS 2017 BO Water Temperature-Related Effects Evaluation

6. For this hearing, I have prepared exhibits and testimony on the water temperature-related effects for steelhead in the lower American River included in the NMFS 2017 BO titled "Endangered Species Act Section 7(a)(2) Biological Opinion, Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response, and Fish and Wildlife Coordination Act Recommendations for the California WaterFix Project in Central Valley, California."

7. This proceeding involves a petition to change the water-right permits of the CVP and the SWP to add points of diversions on the Sacramento River to enable diversions into the California WaterFix tunnels. To evaluate the possible effects on lower American River steelhead that could occur if the CVP's and the SWP's water-right permits are modified to enable such diversions, I have reviewed the water temperature-related information presented in the NMFS 2017 BO. My review was conducted in relation to the State Water

Resources Control Board's (SWRCB) statement of the following key issue in its August 31, 2017 ruling in this proceeding entitled California WaterFix Hearing – Ruling Regarding Scheduling of Part 2 and Other Procedural Matters: "*Will the changes proposed in the petition unreasonably affect fish and wildlife or recreational uses of water, or other public trust resources?*"

8. In assessing whether the proposed changes to the CVP's and the SWP's water-right permits would "*unreasonably affect fish and wildlife*," specifically steelhead in the lower American River, I have used the following analytical standard: *Would implementation of the WaterFix exacerbate water temperature conditions where the analytical baseline already represents degraded conditions for steelhead, for which the status is poor, in the lower American River?* I focused my analysis on steelhead, because they are listed as threatened under the federal Endangered Species Act (ESA), and were evaluated for the lower American River in the NMFS 2017 BO.

9. I based my development of the above-described analytical standard on my experience conducting fishery impact analyses under the ESA, and on my previous experience in a prior SWRCB hearing concerning a water-right change petition.

10. In addition to my extensive work on the lower American River, for 20 years I have been the primary consulting fishery biologist for Yuba County Water Agency (YCWA) in matters regarding its operations related to the lower Yuba River. Like the lower American River, the lower Yuba River supports steelhead. As part of my work for YCWA, I testified in the SWRCB's 2007 hearing concerning YCWA's petition to change its water-right permit to incorporate the flow schedule provisions stated in the Lower Yuba River Accord Fisheries Agreement, and to authorize long-term water transfers from YCWA through the CVP's and the SWP's south-Delta export facilities.

11. The SWRCB approved YCWA's change petition, with conditions, in its Corrected Order WR 2008-0014 and Order WR 2008-0025. In those orders, the SWRCB relied on my testimony in determining that approving YCWA's change petition would not cause unreasonable impacts on fish and wildlife. In particular, the SWRCB relied on my testimony concerning the effect of water temperature changes on steelhead lifestages.

12. Corrected Order WR 2008-0014 and Order WR 2008-0025 identify key principles included in an analysis for determining whether approving a water-right change petition would unreasonably affect fish and wildlife. Those elements include the following:

    - Water temperature impacts to species listed under the ESA are "*of special concern*" and there is a "*low threshold for unreasonable impact for listed species.*" (Corrected Order WR 2008-0014, p. 41; Order WR 2008-0025, p. 41.)

    - Where the relevant environmental analysis shows that a project benefits a species in the vast majority of years, potential detriment in a limited number of years may be acceptable. (Corrected Order WR 2008-0014, pp. 40-41; Order WR 2008-0025, pp. 40-41.)

13. The principles stated in Corrected Order WR 2008-0014 and Order WR 2008-0025 for the SWRCB's consideration of a water-right change petition are consistent with principles that, based on my experience with the ESA, I understand to support determinations under that law about a project's effects.

14. According to the 1999 NMFS document titled "The Habitat Approach - Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids" (NMFS 1999, p. 6), "[t]*he reason for determining the species' status under the environmental baseline (without the effects of the proposed or continuing action) is to better understand the relative significance of the effects of the action upon the species' likelihood of survival and chances for recovery. Thus if the species' status is poor and the baseline is degraded at the time of consultation, it is more likely that any additional adverse effects caused by the proposed or continuing action will be significant.*" A copy of this document is located at http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/habitatapproach_081999-2.pdf.

15. Based on the foregoing, my review of NMFS 2017 BO water temperature-related effects evaluation focuses on whether the proposed changes to the CVP's and SWP's water-right permits would "*unreasonably affect*" steelhead in the lower American River.

Findings Based on Review of the NMFS 2017 BO Water Temperature-Related Effects Evaluation

16. Based on my review of the NMFS 2017 BO, and as described in more detail in **Exhibit ARWA-703**, my key findings are described in the following sections.

Finding No. 1: The Current Status of Steelhead in the Lower American River is Poor

17. The poor status of steelhead in the lower American River is demonstrated in the NMFS 2017 BO by the following direct statements.

- NMFS (2017, Appendix B, p. 43) – "*An average of 143* [steelhead] *redds have been counted on the American River from 2002 to 2015 (data from Hannon et al. 2003; Hannon and Deason 2008; Chase 2010).*"

- NMFS (2017, p. 74) – "*The American River* [steelhead] *population is small, with only a few hundred individuals returning to spawn each year (Reclamation 2015).*"

- NMFS (2017, p. 985) – "*Within the American River,* [steelhead] *redd counts have shown a decline of approximately 6% a year over the past decade. Over the period from 2002-2015, the annual average redd count on the American River was 142 redds per year. However, in 2015, only 58 redds were observed, which is the lowest number ever observed for this particular survey.*"

- NMFS (2017, p. 56) - "*Most wild CCV* [California Central Valley] [steelhead] *populations are very small and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change.*"

- NMFS (2017, Appendix B, p. 44) – "*Overall, steelhead returns to hatcheries have fluctuated so much from 2001 to 2015 that no clear trend is present, other than the fact that the numbers are still far below those seen in the 1960s and 1970s, and only a tiny fraction of the historical estimate. Returns of natural origin fish are very poorly monitored, but the little data available suggest that the numbers are very small….*"

- NMFS (2017, p. 56) – "*In summary, the status of the CCV steelhead DPS* [Distinct Population Segment] *appears to have remained unchanged since the 2011 status review, and the DPS is likely to become endangered within the near future throughout all or a significant portion of its range (NMFS 2016a)*."

Finding No. 2: Conditions in the Lower American River are Degraded

18. Current habitat conditions, and conditions under the analytical baseline used by NMFS (the No Action Alternative (NAA)) in its 2017 BO, in the lower American River are degraded. This is demonstrated, in part, by the following direct statements in the NMFS 2017 BO.

- NMFS (2017, p. 56) – "*…the current conditions of CCV steelhead critical habitat are significantly degraded…*"

- NMFS (2017, p. 56) – "*Many of the PBFs* [physical or biological features] *of CCV steelhead critical habitat are degraded and provide limited high quality habitat.*"

- NMFS (2017, p. 75) – "*CCV steelhead spawn in this reach of the upper accessible Sacramento River as well as throughout the lower American River between its confluence with the Sacramento River up to Nimbus Dam. The PBF of freshwater spawning sites for these species has been degraded within the action area due to high water temperatures...*"

- NMFS (2017, p. 76) – "[steelhead] *Freshwater rearing and migration PBFs have been degraded from their historical condition within the action area…The lower American River has experienced similar losses of rearing habitat…*"

- NMFS (2017, p. 1020) – "*…In the American River, below Nimbus dam, excessive temperatures attributable to the baseline strongly indicate that* [steelhead] *eggs still in the gravel or laid in April and May will have the potential for substantially reduced viability and a high proportion of mortality or embryo abnormalities which will affect their future survival and fitness.*"

19. The Biological Assessment (BA) for the California WaterFix (Reclamation 2016) also referred to degraded habitat in the lower American River associated with warm water temperatures.

- Reclamation (2016, p. 4-36) – "*In the American River, NMFS (2009: 192) noted that there is general consensus that critical habitat for CCV steelhead is impaired, with particular concern being CVP operational effects: warm water temperatures during embryo incubation, rearing, and migration;*"

20. The Central Valley anadromous salmonid recovery plan (NMFS 2014) also recognizes the degradation of steelhead habitat, and the role that elevated water temperatures play in that degradation as supported by the following statements. A copy of this document is located at http://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/california_central_valley/final_recovery_plan_07-11-2014.pdf.

- NMFS (2014, p. 56) – "*The habitat in the Central Valley that remains accessible to anadromous O. mykiss* [steelhead] *has been drastically altered and degraded.*"

- NMFS (2014, Appendix B, p. 4-36) – "*Water temperatures during the summer months can become unsuitable for juvenile steelhead rearing and potentially high water temperatures is believed to be one of the limiting factors for steelhead production (SWRI 2001).*"

- NMFS (2014, Appendix A, p. 17) – "*Key stressors to steelhead in the American River include… Warm water temperatures, particularly below dams, affecting juvenile rearing and outmigration and adult immigration and holding.*"

- NMFS (2014, Appendix A, p. 18) – "*There is a general consensus in the available literature suggesting that habitat for steelhead in the American River below Nimbus Dam is impaired (Reclamation 2008; NMFS 2009a; Water Forum 2005; Water Forum 2005a; SWRI 2001; CDFW 1991, 2001). Of particular concern are warm water temperatures… It has been suggested that the environmental factor probably most limiting to natural production of steelhead in the lower American River is high water temperatures during the summer and fall (Water Forum 2005; Reclamation 2008).*"

- NMFS (2014, Appendix A, p. 21) – "*Water temperature management for anadromous salmonids is an issue of concern in the lower American River.*"

Finding No. 3: Substantial Differences Occur in the Water Temperature Exceedance Distributions between the Proposed Action and the No Action Alternative for Steelhead in the Lower American River

21. In NMFS's 2017 BO for WaterFix, NMFS's examination and evaluation of lower American River monthly water temperature exceedance curves pertinent to specific steelhead lifestages (i.e., adult immigration, adult holding, spawning and embryo incubation, kelt emigration) under the Proposed Action (PA) relative to the analytic baseline (i.e., the NAA) resulted in the general and conclusory statements of …"*the curves were similar overall*" and …"*no substantial differences between curves for the NAA and PA*".

22. However, a detailed review of the NMFS 2017 BO, including water temperature exceedance distributions presented within the BO and in Reclamation's 2016 WaterFix BA (Appendix 5.C), as referenced by the BO, leads me to conclude that substantial differences do occur in the water temperature exceedance distributions between the PA and the NAA for specific lifestages of steelhead in the lower American River, as summarized below and described in **Exhibit ARWA-703**. When water temperatures exceed NMFS's identified lifestage-specific thresholds, the PA (relative to the NAA) would result in the following exacerbated water temperature conditions for steelhead in the lower American River.

    - Juvenile rearing. Less suitable (> 0.5°F up to nearly 4°F warmer) water temperatures over more than 50% of the time during August of critical years at Watt Avenue.

    - Juvenile rearing. Less suitable (> 0.5°F up to more than 2°F warmer) water temperatures over nearly 25% of the dry water year type exceedance distribution at Watt Avenue during August.

- Juvenile rearing. Less suitable (> 0.5°F up to about 2°F warmer) water temperatures over nearly 80% of the entire critical water year type exceedance distribution at Hazel Avenue during August.

- Smolt emigration. Less suitable (> 0.5°F up to more than 1°F warmer) water temperatures over more than 40% of the time during June of above normal years at Hazel Avenue.

23. These substantial differences represent incremental adverse effects of the PA, relative to the NAA.

Finding No. 4: The Substantial Adverse Effects Presented in the NMFS 2017 BO, and by Reference in the WaterFix BA, are Significant

24. According to the NMFS (1999) Habitat Approach …"*if the species' status is poor and the baseline is degraded at the time of consultation, it is more likely that any additional adverse effects caused by the proposed or continuing action will be significant."*

25. Because the status of steelhead is poor and baseline conditions are degraded in the lower American River, the substantial adverse effects described above are significant.

Finding No. 5: The Significant Adverse Effects Presented in the NMFS 2017 BO, and by Reference in the WaterFix BA, are Unreasonable

26. The water temperature exceedance distributions referenced in the NMFS 2017 BO, and presented in the WaterFix BA (Appendix 5.C, Figures 5.C.7-14-7 through Figure 5.C.7-14-19 for Hazel Avenue, and Figures 5.C.7-15-7 through Figure 5.C.7-15-19 for Watt Avenue), demonstrate some improved (i.e., cooler) water temperature conditions under the PA. These conditions occur over some portion of the water temperature exceedance distributions during some months. However, the PA does not provide water temperatures that benefit steelhead in the lower American River in the vast majority of years, and therefore does not represent the situation where potential detriment in a limited number of years may be acceptable. (Corrected Order WR 2008-0014, pp. 40-41; Order WR 2008-0025, pp. 40-41.)

27. My analysis of the water temperature exceedance distributions referenced in the NMFS 2017 BO and presented in the WaterFix BA demonstrate that significant, incremental adverse water temperatures would result from implementation of the PA, relative to the analytical baseline (NAA). Water temperature impacts to species listed under the ESA are "*of special concern*" and there is a "*low threshold for unreasonable impact for listed species.*" (Corrected Order WR 2008-0014, p. 41; Order WR 2008-0025, pp. 40-41.) Without countervailing significant benefits, these identified water temperature impacts to the federally listed steelhead in the lower American River are unreasonable.

28. In conclusion, implementation of the WaterFix would exacerbate water temperature conditions where the analytical baseline already represents degraded conditions for steelhead, for which the status is poor, in the lower American River. The proposed changes in the petition therefore will unreasonably affect steelhead in the lower American River.

SUBJECT 2: BIOLOGICAL SUPPORT FOR THE MODIFIED FLOW MANAGEMENT STANDARD

Participation in the Development of the Modified Flow Management Standard

29. I participated in the development of the Modified FMS, which is being presented in this hearing. My participation included a primary role in the development of *Biological Rationale, Development and Performance of the Modified Flow Management Standard* (Biological Rationale), which explains the biological rationale for the Modified FMS's elements. The Biological Rationale is **Exhibit ARWA-702.** The technical work reflected in the Biological Rationale was based on steelhead and fall-run Chinook salmon lifestage-specific habitat and water temperature considerations in the lower American River. The Modified FMS is accurately described in Technical Memorandum 1: Project Description - Lower American River Modified Flow Management Standard, which is **Exhibit ARWA-602.**

30. The Biological Rationale accurately reflects my analysis of the Modified FMS. The major points of that analysis are that relative to operations under the existing flow requirements (referred to as the 2006 FMS), the Modified FMS would avoid redirected potential water temperature-related impacts to listed species on the Sacramento River, while resulting in the following in the lower American River:

- In March and April, improved (i.e., cooler) water temperatures would occur and potentially benefit steelhead spawning and embryo incubation.
- The Modified FMS would result in improved (i.e., cooler) water temperature conditions during the warmest months of the year of May through September, resulting in the following benefits for fall-run Chinook salmon and steelhead in the lower American River.
    i. Fall-run Chinook salmon lifestages that occur during the May through September period that would benefit from improved (i.e., cooler) water temperature conditions during this timeframe include adult pre-spawn staging and juvenile rearing and emigration.
    ii. Steelhead lifestages that occur during the May through September period that would benefit from improved (i.e., cooler) water temperature conditions during this timeframe include adult holding, embryo incubation through emergence, and juvenile rearing and emigration.
- Similar amounts of spawning habitat for both fall-run Chinook salmon and steelhead.
- Similar estimates of potential redd dewatering for fall-run Chinook salmon.
- Similar or slightly improved estimates of potential redd dewatering for steelhead.
- Increased number of pulse flow events to act as emigration cues for juvenile fall-run Chinook salmon and steelhead smolts during winter/early spring, primarily during dry and below normal water year types.