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8 PACIFIC COAST FEDERATION OF
9 FISHERMEN'S ASSOCIATIONS and
10 INSTITUTE FOR FISHERIES RESOURCES

10 BEFORE THE
11 CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

12 HEARING REGARDING PETITION FILED 13 BY THE DEPARTMENT OF WATER 14 RESOURCES AND U.S. BUREAU OF 15 RECLAMATION REQUESTING CHANGES 16 IN WATER RIGHTS FOR THE CALIFORNIA 17 WATERFIX PROJECT	12 PACIFIC COAST FEDERATION OF 13 FISHERMEN'S ASSOCIATIONS' AND 14 INSTITUTE FOR FISHERIES 15 RESOURCES' CROSS EXAMINATION 16 QUESTIONS FOR DWR ENGINEER 17 SHANMUGRAM PIRABAROOBAN 18 Hearing Date: August 24, 2016 Time: 9:00 a.m.
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19 TO HEARING OFFICERS DODUC, MARCUS AND D'ADAMO:

20 Pursuant to the direction of Hearing Chair Doduc on August 23, 2016, please find below
21 the questions of Pacific Coast Federation of Fishermen's Associations and Institute for Fisheries
22 Resources for Petitioners' Engineering Panel witness Shanmugram Pirabarooban:

23 **Questions for Shanmugram Pirabarooban**

24 **(As part of the engineering panel with John Bednarski, Sergio Valles, and Gwen Buchholz)**
25 **200-Year Flood Event.**

26 Please refer to DWR-57, p. 8 (WaterFix has the ability to withstand a 200-year flood event
27 with climate change).

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PCFFA/IFR CROSS EXAMINATION
QUESTIONS FOR DWR ENGINEER
SHANMUGRAM PIRABAROOBAN

- 1 Q: Why was a 200-year flood event selected instead of, say, a 500-year flood event?
- 2 Q: Is it true that 500-year seismic events were considered? If so, is there a reason 500-year
3 flood events were not?
- 4 Q: Over the 100-year design life of the WaterFix project what is the probability that a 500-
5 year flood event would occur?
- 6 Q: How does this compare with the probability that a 200-year flood event would occur
7 during the 100-year design life?
- 8 Q: Does your calculation of a 200-year flood event include 200 years of climate change
9 impacts? If not, how many years of climate change impact are included in your calculation?
- 10 Q: Is it true that much of the calculation of climate change impacts appears to have been
11 limited to the change projected to occur by 2025?
- 12 Q: Does this leave out almost the entire 100-year design life of the project if planning and
13 construction times are taken into account?
- 14 Q: Should your calculation have included all of the climate change impacts that are projected
15 to occur within the 100-year design life?

16 **Sea Level Rise.**

17 Please refer to DWR-212, p. 51 (engineered to 18 inches of sea level rise).

- 18 Q: Was 18 inches of sea level rise selected on the basis of the Blue Ribbon Task Force's
19 recommendations, or was there some other basis for selecting 18 inches?

20 Please refer to PCFFA-8.

- 21 Q: Do you agree with the Independent Science Board's comment, as cited by the Blue
22 Ribbon Panel, that initial estimates of sea level rise may be low? If so, how did you take this into
23 account in your calculations of sea level rise expected during the 100-year design life? If you
24 don't agree with this comment, what is the basis for your disagreement?

- 25 Q: Please refer to PCFFA-9. Do you agree with the Delta Independent Science Board's
26 comment to the effect that Bay Delta Conservation Plan sea level rise estimates are not adequately
27 evaluated? If so, how did you take this into account in your calculations of sea level rise expected
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1 during the 100-year design life? If you don't agree with this comment, what is the basis for your
2 disagreement?

3 Please refer to PCFFA-10.

4 Q: Do you agree with the National Oceanic and Atmospheric Administration's 2012
5 preferred infrastructure prediction of 6.6 feet of sea level rise by 2100? If so, how did you take
6 this into account in your calculations of sea level rise expected during the 100-year design life? If
7 you don't agree, what is the basis for your disagreement?

8 Q: In what year is 18 inches of sea level rise predicted to occur in the vicinity of the proposed
9 North Delta Diversion intakes? Why did you pick this year?

10 Q: What amount of sea level rise in San Francisco Bay corresponds to the 18 inch rise at the
11 North Delta Diversion intakes?

12 Q: Have you calculated the probability that sea level rise at the North Delta Diversion intakes
13 will be greater than 18 inches within the 100-year design life? If so, what is that probability? If
14 you have not done this calculation, would it be prudent to do so now?

15 Q: What would happen if sea level rise were greater than 18 inches at the North Delta
16 Diversion intakes during the 100 year design life?

17 **Earthquakes**

18 Q: What is the design earthquake in terms of Richter Scale magnitude for each major
19 component of the WaterFix?

20 Q: What are the names of the faults whose foreseeable rupture the WaterFix is designed to
21 withstand? What Richter Scale magnitude did you assign to each of these faults for the design
22 life of the WaterFix?

23 Q: What is the magnitude of expected ground motion at the WaterFix facilities during their
24 design life, expressed as (1) lateral acceleration; (2) vertical acceleration; and (3) ground
25 displacement?

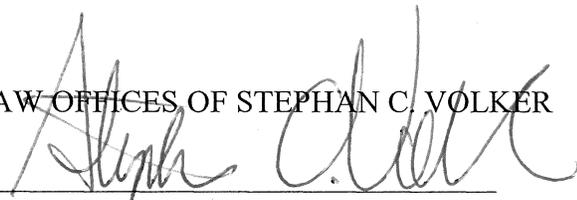
26 Q: What are the documents upon which you based your calculations of expected ground
27 motion during the WaterFix's design life?

28 Q: How has your design taken these ground motion calculations into account?

1 Q: What emergency procedures are contemplated if an earthquake exceeds these design
2 criteria?

3 Dated: August 24, 2016

LAW OFFICES OF STEPHAN C. VOLKER


STEPHAN C. VOLKER

Attorney for Protestants

PACIFIC COAST FEDERATION OF FISHERMEN'S
ASSOCIATIONS and INSTITUTE FOR FISHERIES
RESOURCES

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STATEMENT OF SERVICE

CALIFORNIA WATERFIX PETITION HEARING
Department of Water Resources and U.S. Bureau of Reclamation (Petitioners)

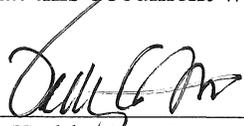
I hereby certify that I have this day submitted to the State Water Resources Control Board and caused a true and correct copy of the following document(s):

**PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS' AND
INSTITUTE FOR FISHERIES RESOURCES' CROSS EXAMINATION QUESTIONS
FOR DWR ENGINEER SHANMUGRAM PIRABAROOBAN**

to be served by Electronic Mail (email) upon the parties listed in Table 1 of the Current Service List for the California WaterFix Petition Hearing, dated August 8, 2016, posted by the State Water Resources Control Board at

http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/california_waterfix/service_list.shtml

I certify that the foregoing is true and correct and that this document was executed on August 24, 2016.



Name: Teddy Ann Fuss
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