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6 Attorneys for CITY OF BRENTWOOD

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8 BEFORE THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

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In the matter of 2016 SWRCB Hearing re CalWaterFix Petition for Change

TESTIMONY OF SUSAN PAULSEN

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BACKGROUND AND QUALIFICATIONS

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2 1. My name is Susan Paulsen and I am a Registered Professional Civil Engineer in
3 the State of California (License # 66554). My educational background includes a Bachelor of
4 Science in Civil Engineering with Honors from Stanford University (1991), a Master of Science
5 in Civil Engineering from the California Institute of Technology (“Caltech”) (1993), and a Doctor
6 of Philosophy (Ph.D.) in Environmental Engineering Science, also from Caltech (1997). My
7 education included coursework at both undergraduate and graduate levels on fluid mechanics,
8 aquatic chemistry, surface and groundwater flows, and hydrology, and I served as a teaching
9 assistant for courses in fluid mechanics and hydrologic transport processes.

10 2. I currently am a Principal and Director of the Environmental and Earth Sciences
11 practice of Exponent, Inc. (“Exponent”). Prior to that, I was the President of Flow Science
12 Incorporated, in Pasadena, California, where I worked for 20 years, first as a consultant (1994-
13 1997), and then as an employee in various positions, including President (1997-2014). I have 25
14 years of experience with projects involving hydrology, hydrogeology, hydrodynamics, aquatic
15 chemistry, and the environmental fate of a range of constituents.

16 3. My Ph.D. thesis was entitled, “A Study of the Mixing of Natural Flows Using
17 ICP-MS and the Elemental Composition of Waters,” and the major part of my Ph.D. research
18 involved a study of the mixing of waters in the Sacramento-San Joaquin Bay-Delta (the Delta)
19 using source water fingerprints. I also directed model studies to use the chemical source
20 fingerprinting to validate the volumetric fingerprinting simulations using Delta models (including
21 the Fischer Delta Model (FDM) and the Delta Simulation Model (DSM)). I have designed and
22 directed numerous field studies within the Delta using both elemental and dye tracers, and I have
23 designed and directed numerous surface water modeling studies within the Delta. A copy of my
24 curriculum *vitae* is included as Exhibit Brentwood-101.

SUMMARY OF TESTIMONY

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26 4. I was retained by the City of Brentwood to assist the City in its evaluation of the
27 California WaterFix Project (WaterFix). My testimony includes comments on the changes in
28 hydrodynamics and water quality that are expected to occur after implementation of the proposed

1 WaterFix Project, and an assessment of whether the WaterFix Project will have an impact on the
 2 supply and quality of water available to Brentwood, which uses fresh water from the Delta for
 3 potable municipal supply.

4 5. This testimony presents three primary Opinions in response to the SWRCB's
 5 Notice of Petition:

- 6 • Opinion 1: DWR's evaluation of the proposed WaterFix project is inadequate
- 7 • Opinion 2: WaterFix will result in substantial changes in Delta hydrodynamics and
 8 degradation of Delta water quality
- 9 • Opinion 3: Compliance with water quality standards is likely to become more
 10 challenging in the future, and WaterFix will degrade the water quality of the City's
 11 water supply.

12 Additional details of my opinions are provided in the report entitled, "Report on Effects of the
 13 Proposed California WaterFix Project on Water Quality at the City of Brentwood," (Exhibit
 14 Brentwood-102).

15 **TESTIMONY**

16 **Opinion 1: DWR's evaluation of the proposed WaterFix project is inadequate.**

17 6. I have identified four primary reasons why DWR's evaluation of WaterFix is
 18 inadequate. First, the modeling used to evaluate the WaterFix Project is flawed in that it uses an
 19 inappropriate baseline condition. Specifically, DWR uses the No Action Alternative, or "NAA"
 20 scenario, to represent "baseline conditions," even though DWR has conducted modeling runs to
 21 describe the existing condition. Because the NAA is a future scenario that includes 15 cm of sea
 22 level rise, the NAA scenario at times has higher salinity than existing conditions, which results in
 23 a higher salinity "baseline" that masks some of the water quality effects of the WaterFix project.

24 7. Second, WaterFix project operations are poorly defined. DWR presents a very
 25 broad range of potential operations scenarios without a clear indication of the criteria by which
 26 the project would be operated, or the criteria by which project operations would be changed, such
 27 that it is difficult to assess the potential impacts of the Project to the City's water rights and water
 28 supply.

1 8. Third, the Adaptive Management and Monitoring Program (AMMP) is undefined
2 and would provide DWR broad flexibility in operations that could lead to significant impacts to
3 water quality. It appears that the AMMP may focus on impacts to fish species rather than impacts
4 to municipal and industrial users of water within the Delta.

5 9. Finally, DWR asserts that the WaterFix Project will provide additional operational
6 flexibility that will lead to improvements in meeting water quality and flow objectives in the
7 Delta. However, DWR's analysis, when disaggregated to show daily and monthly variability,
8 actually indicates that water quality in the Delta will be degraded and there would be reduced
9 compliance with water quality objectives under Scenario B1.

10 **Opinion 2: WaterFix will result in substantial changes in Delta hydrodynamics and**
11 **degradation of Delta water quality**

12 10. The proposed WaterFix Project will almost certainly export more water from the
13 Delta than is currently exported. DWR's testimony indicates that Operational Scenario Boundary
14 1 would result in an average of about 1,200,000 acre-feet per year of additional exports, while
15 Scenarios H3 and H4 would result in about 500,000 acre-feet per year of additional exports.
16 (Although Boundary 2 would result in less water exported from the Delta, it appears unlikely,
17 based on DWR's testimony, that it would be implemented.) In addition, the proposed WaterFix
18 Project will remove more high quality Sacramento River water from the Delta than under existing
19 conditions. The WaterFix Project will thereby cause changes in the composition and quality of
20 water within the Delta and will increase the residence time of water in the Delta, resulting in
21 degraded water quality. Scenario Boundary 1 of the proposed WaterFix Project will cause a
22 significant increase in salinity and a significant reduction in the number of days useable water is
23 available to the City, particularly during dry, below normal, and above normal water years.

24 **Opinion 3: Compliance with water quality standards is likely to become more**
25 **challenging in the future, and WaterFix will degrade the quality of the City's water supply.**

26 11. DWR's model results show that the proposed WaterFix Project can be expected to
27 lead to increased difficulty in complying with water quality and flow criteria in the Delta.
28 Compliance is currently challenging, as indicated by the recent issuance of orders in response to

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1 Temporary Urgency Change Petitions (TUCPs) by the State Water Board. Contrary to DWR’s
2 assertions that the recent drought conditions are “truly unprecedented” and “outliers,” available
3 science indicates that climate change is likely to result in more frequent and more severe droughts
4 in the future.

5 12. My analysis of DWR’s model results indicates that complying with D-1641 water
6 quality objectives will become more challenging in the future than under current conditions due
7 to both climate change effects and the potential operations of the WaterFix Project. My analysis
8 of DWR’s model results shows WaterFix operations will result in additional exceedances of with
9 D-1641 Water Quality Objectives for chloride for municipal and industrial beneficial uses relative
10 both to existing conditions and to the NAA (future no project) scenario. In addition, DWR
11 proposes to re-interpret the export-to-inflow (E/I) ratio requirements of D-1641 such that an
12 important control on the amount of water exported from the Delta would be removed; however,
13 DWR’s modeling shows that exceedances of the existing E/I objective (i.e., the ratio of total
14 exports to total inflows) will occur more frequently in the future under Scenario Boundary 1.
15 Taken together, DWR’s model results indicate that the WaterFix Project, particularly the
16 Boundary 1 scenario, will degrade water quality within the Delta and will degrade the water
17 quality of the City’s water supply.

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