SJC-291

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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 WATER FIX	**WRITTEN TETIMONY OF CHRISTOPHER H. NEUDECK** **PART 2 CASE IN CHIEF**

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BACKGROUND

1. I am Christopher H. Neudeck, with Kjeldsen, Sinnock & Neudeck, Inc. (KSN) 711 North Pershing Avenue Stockton, California 95203. I am a Registered Civil Engineer in the State of California and have worked with Reclamation District's/Delta Islands including flood control, drainage, levee rehabilitation and maintenance, irrigation, financial and project management and related areas for 35 years since 1982 when I joined the firm. I am the District Engineer for 22 Reclamation Districts in the Sacramento San Joaquin Delta (Delta). A statement of my qualifications is attached hereto as **(SJC-291).**

2. I have been providing expertise in this area throughout the Central Valley and, in particular, the Sacramento San Joaquin Delta Region. I have included a map as **(SJC-292)** showing the Districts that KSN represents throughput the Central Valley and highlighted in yellow the ones where I serve as the District's Engineer.

3. As District Engineer, I am responsible for advising the Districts on issues related to the operation and maintenance of the Districts' Reclamation works, including levees and drainage systems. Duties include attendance at all Board Meetings; advising Trustees of the District on all engineering matters; preparing and filing the District's Levee Subvention Application and Final Claims; preparing plans and specifications for improvements to Reclamation Works as required; and conducting profile and cross section surveys of the District levees as required; preparing for and respond to, potential and actual flood events. I am responsible for Levee Patrol and Flood Emergency Plans and preparation of Flood Safety Plans in accordance with Section 9650 of the California Water Code; I coordinate

efforts with the County Emergency Services, and Local Reclamation Districts to assure that the District plans and Flood Emergency Plans are consistent with local agencies within the geographic area; I develop long range goals and objectives for the District; I assist with permit applications, general plan review of levee encroachments and consider the development of rules and regulations guiding improvements along the District's flood control levees; I assist the District Secretaries in preparing and monitoring annual budgets; I conduct semi-annual joint inspections of the District to determine the sufficiency of the maintenance and operation services which are being provided by the District; I regularly represent the District, at meetings or conferences where local, regional statewide or national flood control or levee issues are discussed; I prepare Engineer's Reports for, and assist in conducting, Proposition 218 ballot proceedings; I prepare and process annual assessments; & I consult with the District's attorney, to be aware of, and report on, prospective legislation and regulations which could affect the District.

OVERVIEW OF TESTIMONY

4. In preparation of this testimony, I have reviewed and relied primarily upon two main documents, the 2016 Final BDCP/California WaterFix EIR/EIS-Volume I (WaterFix EIR), and the Economic Sustainability Plan (ESP) for the 2012 Sacramento San Joaquin Delta prepared for the Delta Protection Commission.

5. My testimony will focus on the effects of the California WaterFix project impacts on the Reclamation works (levees and drainage) of Districts in the Sacramento San Joaquin Delta.

6. Understanding Delta levees and drainage is complex and requires years of experience in order to understand the unique characteristics of the Delta system, particularly as it relates to the soil types, shallow ground water, organic levee foundations, subsided lands behind levees, seepage from adjacent sloughs and rivers, compacted and varying soil types in levee fill materials which all lead to design and construction challenges while improving and maintaining levees within the Delta.

IMPACTS TO RECLAMATION DISTRICT LEVEES AND ADJOINING CHANNELS

7. Undertaking of the WaterFix project will have significant impacts on the ongoing ability of Districts to perform the routine operation and maintenance operations as well as interfere in major improvement projects intended to sustain the current level of flood protection provided by the District's levees.

8. The WaterFix project with substantially interfere with routine operation and maintenance tasks on many of the Districts in the Delta during the 14 year+ construction period. The number of truck trips is estimated in the tens of thousands on District levees and access roads. A well-known fact is that if you haul loaded trucks on levees over an extended period of time that the subgrade and foundation of a significant portion of those levees will consolidate and settle. Through my experience in constructing and maintaining Delta levees, I have seen settlement of six (6) inches to one (1) foot of settlement due to heavy truck traffic on a levee during construction activity. According to the WaterFix EIR Chapter 19 – Transportation reference is made to the number of truck trips and impacts to local roads and the condition of the surfacing of those roads. The critical fact that the levee

subgrade and foundation under roads on levees will settle and consolidate was completely overlooked in Chapter 19, which is a substantial impact both from a critical flood protection perspective and an economic impact perspective to the Local Districts. Delta levees typically maintain freeboard above the 100 year flood. In many cases that freeboard is just one (1) foot. If truck traffic were to subside and consolidate the levees by one (1) foot, then the Districts would be left with no freeboard over the 100 year flood plain, which would be a critical condition, thus leaving the Districts extremely susceptible to flooding in a high water event. Portions of the Sacramento San Joaquin Delta have experienced 100 year water levels in the past. In addition to impacts in reduction of freeboard associated with WaterFix extraordinary truck haul traffic, District levees are also susceptible to wind and wave run-up that requires additional freeboard if the levee is adjacent to a larger/wider body of water **(SJC-293: photograph of Twitchell Island I took February 7, 1998**).

9. According to the WaterFix EIR Chapter 15 - Recreation reference is made to Barges and Temporary Barge Unloading Facilities. Chapter 15 states that use of barges for water facilities construction and construction of the temporary barge unloading facilities may require partial channel closures and use of equipment within the waterways. Alternative 4 includes seven barge unloading facilities to be built on or near the tunnel alignment at riverbank locations about 4-9 miles apart. The impact of these facilities could become critical during emergency operations as well as routine activities with the Delta. Clear unobstructed channels is imperative to allow safe and clear navigation for marine barge mounted equipment and material barges to provide operation and maintenance access and emergency services responses to District's within the Delta. Clear access is also

required for rehabilitation and flood work throughout the year. These Temporary Barge Unloading Facilities will certainly impact and obstruct marine traffic with areas of the Central Delta. I have shown the representative size of the WaterFix barge offloading facilities at two hundred and fifty (250) feet wide to three hundred and twenty (320) feet wide from the WaterFix You Tube videos of construction. **(SJC 294 & 295)**. I have also attached two exhibits **(SJC 296 & 297)** that represent typical construction activity with marine barge mounted equipment and material barges performing levee rehabilitation work that represents marine equipment widths within the channels of the Central Delta that are one hundred (100) feet to one hundred and fifty (150) feet in width. The construction of these Temporary Barge Unloading Facilities also requires the construction of cofferdams that will further encroach into the channel and provide additional navigational impacts. Beyond the navigational impacts of that these encroaching Temporary Barge Unloading Facilities, they will also impact flood flow capacity of the channels which may result in increased water surface elevations and disturbance of routine tidal exchange and channel flow velocity patterns that will result in increased erosion of adjoining levee embankments as shown in **(SJC 298)**. Channel narrowing as stated in Chapter 15 includes the following references to seven (7) locations of the Temporary Barge Unloading Facilities within the Delta region: **1)** the Sacramento River Temporary Barge Unloading Facilities located 3 miles northeast of Walnut Grove will occupy two hundred (200) feet of levee along the riverbank and extend one hundred and thirty (130) feet into the river. The channel is about a two hundred (200) wide at this location seventy (70) feet for passage of vessels, **2)** southern Bouldin Island (RD 756) on Little Potato Slough the Temporary Barge Unloading Facilities will occupy nine hundred and eighty (980) feet of levee along the riverbank and

extend two hundred and ten (210) feet into the river. The channel is about a one thousand (1,000) wide at this location leaving nearly seven hundred (700) feet for passage of vessels, **3)** on the south side of Venice Island (RD 2023) on the San Juaquin River the Temporary Barge Unloading Facilities will occupy nine hundred and twenty eighty (928) feet of levee along the riverbank and extend and undetermined amount into the river. The channel is about a two thousand (2,000) wide at this location leaving substantial room for passage of vessels, **4)** east side of Mandeville Island (RD 2023) on Middle River the Temporary Barge Unloading Facilities will occupy one hundred and eighty (180) feet of levee along the riverbank and extend one hundred and eighty (180) feet into the river. The channel is about a nine hundred feet (900) wide at this location leaving nearly seven hundred (700) feet for passage of vessels, **5)** north side of Bacon Island (RD 2028) on Connection Slough the Temporary Barge Unloading Facilities will occupy six hundred and sixty five (665) feet of levee along the riverbank and extend two hundred and fifty (250) feet into the river. The channel is about a four hundred feet (400) wide at this location leaving one hundred and fifty (150) feet for passage of vessels, **6)** northwest side of Victoria Island (RD 2040) on Old River the Temporary Barge Unloading Facilities will occupy one thousand (1,000) feet of levee along the riverbank and extend three hundred and twenty (320) feet into the river. The channel is about a five hundred feet (500) wide at this location leaving one hundred and fifty (150) feet for passage of vessels. **7)** on the northeast side of Clifton Court Forebay along West Canal the Temporary Barge Unloading Facilities will occupy one thousand (1,000) feet of levee along the riverbank and extend eighty feet (80) feet into the river. The channel is about a two hundred and fifty feet (250) wide at this location leaving one hundred and seventy (170) feet for passage of vessels. After reviewing

the WaterFix EIR Figures M15-1 Sheet 2 of 7 thru M15-1 Sheet 6 of 7 **(SJC 299 - 303)**, there are substantial differences in the locations of the Temporary Barge Unloading Facilities described in the text and located on the plan. The mapped locations show substantially narrower channels for the location of the Temporary Barge Unloading Facilities, which will aggravate the potential impacts of these facilities.

RISKS ASSOCIATED WITH LEVEE STRENGTH AND STABILITY

10. Levee strength and stability are a constant concern of Districts that I represent. Levee failures, also known as levee breeches, arise from multiple causes, including but not limited to problems associated with erosion, and overtopping. I have made reference relative to the associated WaterFix Project extraordinary truck traffic, leading to levee subsidence and the potential for overtopping of District Levees, resulting in levee breeching. Erosion associated with the placement of the Temporary Barge Unloading Facilities **(SJC-298)** can also lead to levee failure.

11. Delta levee systems are part of an overall related system. These risks are in addition to other problems that Delta levees are susceptible to, including seepage, rodents, critical failure surfaces seismic activity and regional/global climate changes and sea level rise. Levee failures can be caused by under and through seepage **(SJC-304 – 306),** whereby the water travels through a hydraulic conductive layer of material typical sand and course graded material to an extent that it causes material to erode due to the passage of water and if not managed can cause an undermining of levee foundations and ultimate failure of the levee. Rodent activity is another large concern namely because it often goes unnoticed

until a levee collapses or leaks at a high water event due to water penetrating burrowing squirrels and beaver dens and passage ways. Districts diligently inspect their levees regularly and also employ an aggressive rodent control program yet still the risk exists that under a high water condition one of these burrows could communicate enough water through the levee to fail and breach the levee. Static stability is relates to the ability of the levee fill to remain intact and not fail with the hydrostatic forces against them due to the varying tides within the Delta. Districts are constantly improving their levees by widening the width and flattening the slopes and adding stability toe berms on the landside to improve static stability improvements as well as resist under and trough seepage. Seismic activity to date has not been completely addressed within the Districts due to its infrequent nonexistent damage associated with any events. Districts are aware of the Seismic Risk **(SJC-307)** and attempt to mitigate with their static levee stability improvements, predominantly toe berms but currently it is not a top priority. Global warming and sea level rise are a constant threat of my Districts. The Districts are diligent n evaluating the profile of their levees against the most recent design water surface profiles published by the State and Federal Government. Districts are constantly adjusting their design standard to stay ahead of any increasing flood frequency curves that are newly published together with keen consideration of past high water events including evaluation of their levee systems performance. Through my experience of maintaining and operating levee systems within the Delta I have seen 5-6 major high water/flood events and in my opinion it is imperative that the WaterFix consider the potential impacts of levee risk throughout its entire alignment and neighboring Districts along the tunnel route.

12. Seepage from a neighboring flooded island has substantial impact on the neighboring unflooded island **(SJC 308-310: shows seepage impacts from flooded islands on neighboring unflooded islands)**. Seepage impacts have been documented for years associated with neighboring flooded islands including the proposed the Delta Wetlands Project and Prospect Island Project. Seepage from the interconnected former freshwater marsh traversed by numerous existing and former delta distributary channels create these seepage paths between Delta Islands. Many of these distributary channels were intersected by man-made District levees leaving behind seepage paths beneath the levees onto neighboring Districts. These distributary channels are interbedded with sands, silts and clays that are not homogenous and convey seepage water.

13. Seismic activity and risk is present yet not routinely mitigated by agricultural Districts unless the levees protect residential development. The cost to bring levees into compliance with factors of safety against a substantial seismic event are costly. This does not mean the proposed Twin Tunnel project can ignore the seismic risk within the Delta region, and they must consider the risk if a seismic event were to occur and its impact to the proposed segmented concrete tunnel. If the concrete tunnel were to rupture due to a seismic event there is a risk that water could reach the downstream Islands/Districts and flood the interior. There is approximately fourteen (14) feet of head from the intake near Courtland to its discharge into Clifton Court Forebay. **(SJC-311-313 graphic of head in tunnel compared to land surface along with a DWR Delta wide graphic of land below sea level and a photo showing the relationship of above sea level water in the**

channels and below sea level land behind levees) If the tunnel suffers a rupture the water could reach the surface of the ground and flood the Islands/Districts.

RISKS ASSOCIATED WITH IMPACTS TO DISTRICTS' LOCAL ASSESSMENT

14. Districts rely upon the landowners within its District boundaries/levees to pay assessments for the annual operation and maintenance assessment. Each District within the Delta operates and maintains its Reclamation works through its annual assessment. The purpose of the assessment is to pay for the following: retirement of outstanding debt, operation, maintenance, repair and rehabilitation of any District reclamation/levee or drainage work, payment of incidental and administrative expenses related to the operation and maintenance of the District works including but not limited to utilities, insurance, professional services, supplies, equipment, materials, and labor, including construction of supplemental reclamation/levee and drainage works, the replacement of equipment, operating facilities and works and any other use that provide the special benefit identified in the Engineers Report and that serve as the basis for the assessment. If any of the identified impacts set forth above in my testimony or any impacts associated with reduction in water quality associated with the WaterFix project will impact the ability of the Districts to perform their fiduciary responsibilities due to lack of ability for landowners to pay the assessment. The Economic Sustainability Plan for the Sacramento – San Joaquin Delta adopted by the Delta Protection Commission in January of 2012 states on Page 112 **(SJC 314)** the potential impact of policy changes on Delta salinity if highly uncertain at this time and depends on decisions on water quality standards and the effect if isolated conveyance. A preliminary estimate of losses from increased salinity is between $20 million and $80

million per year. The loss of farmland to construct the conveyance facility is estimated to generate an additional $10 to $15 million in crop losses per year. This loss of $30 million to $95 million would be devastating to the ability of landowners to afford the ongoing operation and maintenance assessments of the Districts thus reduction in levee and drainage facilities maintenance leading to substantial risk of levee failure and drainage systems failure.

RISKS ASSOCIATED WITH BORED PIPELINES WITH THE DELTA

15. I have been involved in numerous pipeline crossings beneath levees. I have experienced with jack and bore, directional bore and earth pressure balance tunneling methodologies. Many of the projects that I have been involved with have ultimately been successful but several have had huge challenges. In particular I was involved in a jack and bore project in the mid 1990's constructing a fifty (50) inch diameter sewer line for the City of Stockton Municipal Utilities Department beneath Shima Tract RD 2115's levee and the bore intercepted the bottom of Mosher Slough channel causing the jacking pit and boring machine to be completely flooded. Fortunately the jacking pit was surrounded by a coffer dam levee thus containing the flooded bore pit and failed bore crossing and eliminating the deep flooding 3,000 acres of prime farm land. The second failed condition involved the interconnect pipeline to Contra Costa Water District 2nd Delta Intake on Victoria Canal west of the Main intake facility for its Los Vaqueros Reservoir on Old River. This involved boring a seventy two (72) inch diameter casing for the crossing of Old River with an Earth Pressure Balance boring machine. Shortly after the launching of the boring machine from

the bore pit and just outside the bore pit the boring machine settled heavily on the rear end and starting a projection towards the bottom of Old River rather than staying on the design trajectory. The project was shut down and it took 90 -100 days to engineer and accomplish the very difficult task of backing the boring machine back into the existing bore pit and grouting and realigning the boring machine to stay on the design trajectory. The reason I raise these two issues among others is to demonstrate boring in soft, non-homogeneous soils is a very challenging which places Delta levee systems and the WaterFix at Risk.

I declare under penalty of perjury under the laws of the State of California that the foregoing statements are true and correct.

Executed on the 30th day of November, 2017, at Stockton, California.

CHRISTOPHER H. NEUDECK