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Bogle Vineyards / Delta Watershed Landowner Coalition
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Stillwater Orchards / Delta Watershed Landowner Coalition

BEFORE THE

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

HEARING IN THE MATTER OF CALIFORNIA DEPARTMENT OF WATER RESOURCES AND UNITED STATES BUREAU OF RECLAMATION'S REQUEST FOR A CHANGE IN POINT OF DIVERSION FOR CALIFORNIA WATER FIX	**OPENING STATEMENT OF ISLANDS, INC. AND COMBINED SALINITY PANEL** **Joint Case in Chief of: Islands, Inc., Delta Watershed Landowner Coalition, Bogle Vineyards, Diablo Vineyards, Stillwater Orchards and Local Agencies of the North Delta**

This opening statement is offered on behalf of Islands, Inc. and in combination with the case in chief of Delta Watershed Landowner Coalition, Bogle Vineyards, Diablo Vineyards, Stillwater Orchards and Local Agencies of the North Delta, it is also the opening statement for the Combined Salinity Panel.

I. INTRODUCTION

Islands, Inc. and the other entities represented in the Combined Salinity Panel are either actively engaged in agricultural operations in the Sacramento-San Joaquin Delta or they represent a coalition of entities who have a great concern for agriculture and for preserving agriculture in the Delta.

A. Islands, Inc. Testimony

You will hear testimony from Thomas Hester, who is the President of Islands, Inc. Mr. Hester is a long time resident of the Delta and has farmed on Ryer Island for over 36 years. His father, Clarence Hester was the President of Islands, Inc. before Mr. Hester. Islands, Inc. is situated on Ryer Island. There are two Ryer Islands in the Delta, so it is important to distinguish them. The Ryer Island that is involved here is just north of Rio Vista and is served by Miner Slough and Steamboat Slough, both tributaries of the Sacramento River. Prospect Island is immediately adjacent to Ryer Island. Ryer Island is named for Dr. Washington Ryer, who was General Winfield Scott's Assistant Surgeon in the Mexican-American War of 1848. Dr. Ryer settled in Stockton and began settling Ryer Island in the 1860s. The Ryer Family married into the Louis Nixon Family and the Nixon Family still owns over 6200 acres of Ryer Island, farmed as Islands, Inc.

Islands, Inc. owns riparian water rights that it acquired beginning in 1868 and currently places 9269 acre feet of water to beneficial use, irrigating permanent crops, such as pears, apples and cherries, and annual crops, such as wheat, milo, safflower, alfalfa, tomatoes and asparagus. Irrigation methods are sprinklers, flood irrigation and sub-irrigation. Islands, Inc. diverts its water from Miner and Steamboat Sloughs using s system of siphons. The siphons are primed and then water flows by gravity throughout the island.

Islands, Inc. has a great concern about the quality of water used for irrigation and maintaining that quality if WaterFix is approved. Specifically, Islands, Inc. is concerned about salt water intrusion into the Delta in the face of the removal of a significant amount of fresh water at the North Delta Intake. Islands, Inc. is concerned about other pollutants in the water as well. More will be said about salinity below when the Salinity Panel testimony is summarized.

Islands, Inc. is also concerned about land subsidence as water is withdrawn from the North Delta, the water table will also subside and the land surface will be impacted as it is in the Central Valley. Ryer Island is just a few feet below sea level and it takes a considerable amount of effort to drain the water from the island. If the water table drops then the land surface may also drop. This could cause the surface of the land to drop closer to the water table, which will expose the crops to root rot.

Islands, Inc. is also concerned about the quantity of water that will be available if WaterFix is approved. Withdrawing 9000 cubic feet per second of water represents in some case 40% of the water flow in the Sacramento River. There will be an attendant drop in water levels. As mentioned, Islands, Inc. uses siphons to divert water. If the water level drops even one foot, these siphons are less efficient, A drop of four or five feet in the sloughs and the siphon intakes will be above the water line sucking air.

If there is less water and if there is lesser quality water then Islands, Inc. will have to reconsider its cropping patterns. Islands, Inc. will have to change from high value crops to those of lesser value that are less sensitive to salt. But changes to lesser value crops will have an impact on the economic viability of Island, Inc.'s operations. The operation of farms in the Delta are as fragile as endangered species. Take away a certain crop and suppliers and buyers for that crop go away. After a time the system begins to collapse as there are no more suppliers to support a crop and no more buyers to purchase the crop. Bankers in the Delta focus on water supply as a measure of the credit worthiness of farmers. Without sufficient quantity and quality of water there will be no crops and no credit.

Mr. Hester asks that the Board deny the Petition.

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B. Diablo Vineyards

You will also hear the testimony of Bradford Lange. Mr. Lange is the owner and operator of Diablo Vineyards which grows grapes in Lodi, the Clements Foothills east of Lodi, and the North Delta under the name of Lange Twins. In the North Delta, Lange Twins farms 1600 acres of grapes on Ryer Island, Pearson District and Merritt Island. The wine grapes grown by Lange Twins are marketed to California, the United States and internationally.

Mr. Lange will testify that it takes a considerable investment to grow grapes. The grapes that are grown in the North Delta are there because of the beneficial growing environment and the availability of high quality water. The 1600 acres of vineyards represent an investment value of $24,000,000, not including land costs. Land costs are $16,000 per acre. Thus it takes many years to reap a return on investment.

Mr. Lange has observed in his decades of experience growing grapes that the grape vines do not have a high tolerance for salt. Saltier water used for irrigation negatively affects quality and yield. If the effects are widespread then it could force Diablo out of business. If the modeling effects as shown on DWR 515 and DWR 5E, slide 25 hold true then water quality at the vineyards will suffer. Even relatively small increases in salt can negatively affect the grape vines. Over time a build-up of salt in the soil is of great concern. Diablo depends on good quality water and rain to leach salts from the soil.

Diablo has experienced problems with salt intrusion in the recent drought years at the southern end of Ryer Island. To date there has not been any damage; however, the water table at Ryer Island is only five feet below the surface. Diablo has installed a tile drain system and expanded the drainage to improve growing conditions.

Mr. Lange believes that the WaterFix facilities operations will have a detrimental impact on his operations because the amount of water that will be removed from the system will cause permanent drought conditions that will interfere with the quantity and quality of Diablo's water rights. Mr. Lange asks that the Board deny the Petition.

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II. Salinity Panel

Turning to the Combined Salinity panel, this testimony is being offered on behalf of Islands, Inc., Delta Watershed Landowner Coalition, Bogle Vineyards, Diablo Vineyards, Stillwater Orchards and Local Agencies of the North Delta. The testimony will be the combined efforts of three qualified experts in salinity effects on crops grown in the Delta.

First you will hear from Mr. R. Stanley Grant. Mr. Grant has a B.S. in Geography from California State University, Hayward (1979) and a M.S. in Soil Science from the University of California, Davis (1987). He is a certified professional horticulturist and a certified professional soil scientist. He has 29 years of experience in his specialty. Mr. Grant will testify about the WaterFix opportunities to add to salt water intrusion and about the saline water use in the Delta.

Next you will hear from Dr. Michelle Leinfelder-Miles. Dr. Leinfelder-Miles is the Delta Crops Resource Management Advisor with the University of California Cooperative Extension in San Joaquin County. She has 18 years' experience in agricultural cropping systems. Dr. Leinfelder-Miles has a B.S. in Crop Science and Management from UC Davis (2001), an M.S. in Horticulture from Cornell University (2005) and her Ph.D. in Horticulture also from Cornell University (2010). Dr. Leinfelder-Miles will testify about the soil chemistry associated with salt intrusion on croplands and will provide evidence of soil testing that she conducted on Ryer Island as it relates to the issue of salt build-up in the soil.

Finally, you will hear from Mr. Erik Ringelberg. Mr. Ringelberg is a Ph.D. Candidate in Riparian and Wetland Research at the University of Montana. He has a B.S. in Microbiology from Colorado State University and an M.S. in Environmental Science from Lesley University in Cambridge, Massachusetts. Mr. Ringelberg will testify about the likely impacts on agricultural from WaterFix as it relates to water quantity and quality in the Sacramento River downstream of the North Delta Intakes. He will also provide a criticism of the project analysis presented by Petitioners.

A. Mr. R. Stanley Grant Testimony

Mr. Grant will testify as a vineyard consultant and soil scientist. He has his own company, Progressive Viticulture, LLC. He first started working in the Delta in 1987 as an student intern at Gallo Vineyards and Duarte Nursery. He has worked in the Delta since 2001 on preplan vineyard site evaluations, vineyard design and post plant vineyard management consulting.

Mr. Grant will testify that if the Tunnels are built and operated, a wide range of high value crops will be irrigated with saline waters. Given their high initial capital costs and corresponding long-term return on investment requirements, perennial vineyard and orchard crops in the Delta are the greatest concern for irrigation with saline, sodic, and high chloride waters. For vineyard and orchard crops, saline irrigation waters are those with total dissolved solids (TDS) greater than 640 and 1780 ppm (i.e. electrical conductivity or EC $\geq$ 1.0 to 2.7 dS/m). For these same crops, sodic and high chloride irrigation waters are those with sodium (Na) and chloride (Cl) concentrations greater than 69 to 207 ppm and 142 to 355 ppm, respectively.

With such saline irrigation waters there are both immediate and long-term concerns for tree and grapevine health and orchard and vineyard productivity and profitability. These include both direct effects on trees and vines and indirect affects through degraded orchard and vineyard soils. The long-term effects are especially troubling for Delta soils due to limited and costly options for remediation.

Mr. Grant will offer the following opinions: 1) Irrigated agricultural soils reflect the chemical character of the irrigation water applied to them; 2) Soil salinity from saline irrigation water creates an energy gradient plants have to work against which causes plant stress; 3) Vineyard and orchard soils irrigated with saline-sodic degrade physically; 4) Vineyards and orchards on salinized soils will require extra irrigation water to minimize severe water stress; 5) Sodium and chloride are among the salts in irrigation waters; 6) Sodium and Chloride toxicity leads to foliage damage, incomplete ripening, and for wine grapes, diminished quality or death; 7) Avoidance of chloride and sodium requires more irrigation water and may increase fertilizer requirements; and, 8) Management of saline, sodic and high chloride soils requires adequate subsurface drainage.

At this time, the prevailing situation for Delta agriculture is the most sustainable one, in that it requires few applied resources, make the best use of on-site resources, and has the least off site impacts. High quality, low-salt irrigation water is readily available from Delta rivers and sloughs. There is limited need to apply extra water as leaching fractions to flush salts. No complex engineered drainage systems, additional fertilizers, and other mitigation measures are required under current conditions to offset salinity. Delta vineyards and orchards, as they currently are, use water efficiency to produce an abundance of high quality fruit for people in the United States and beyond.

B. Dr. Michelle Leinfelder-Miles Testimony

Dr. Leinfelder-Miles conducts a multidisciplinary research and outreach program on agricultural production and resource stewardship. Her research projects center on row crops and the management of water and soil resources in those agricultural systems. She has dedicated considerable time to assessing soil salinity conditions in the Delta because salinity has the potential to impact crop productivity and soil resource management.

Dr. Leinfelder-Miles begins her analysis by examining the chemistry in salt loaded soil. The salt load is typically estimated by measuring electrical conductivity (EC). Positively-charged cations (Ca^{2+}, Mg^{2+}, K^{+}, and Na^{+}) join with negatively-charged anions (Cl^{-}, SO_4^{-}, HCO_3) to form soluble salts ($NaCl$, $CaCl_2$, $MgCl_2$, $CaSO_4$, $CaCO_3$, and KCl). In a solution, the ions disassociate and will move toward an electrode of the opposite charge, creating a current that can be measured with an EC meter. When the solution comes from a soil saturated paste (methods described in Section IV), the abbreviation used is ECe, and when the solution is water, the abbreviation is ECw. A unit of measure for EC is decisiemens per meter (dS/m) or millimhos per centimeter (mmhos/cm), which are equivalent. Decisiemens per meter can be converted to microsiemens per centimeter (µS/cm) by multiplying by 1,000 (i.e. 1 dS/m equals 1,000 µS/cm).

Under a non/low-saline condition, the concentration of solutes (i.e. sugars and organic acids transported in the plant vascular system) is higher in plant roots than in the soil-water solution. This means that water moves freely into the plant roots because there is more force, called osmotic potential, pulling the water into the plant roots than there is force holding the water to the soil particles. Under conditions of higher soil salinity, plants must transport solutes within the plant to the roots in order to keep root solutes higher than soil-water solution solutes to avoid water stress. Remobilizing solutes requires energy, and that energy, then, is not used for plant growth. Thus, some plants will not show specific salt-induced symptoms as a result of saline soil conditions; rather, they may just exhibit lower growth or generic stunting which may or may not be realized by the farmer as being salt-induced (II-16, Hanson et al., 2006).

Plant growth may also be impaired by specific ions, like sodium (Na^+), chloride (Cl^-), or boron (B), which can accumulate in plant stems and leaves. This results in burning on the leaf tips or around the margins. Sodium is not an essential nutrient for plants, and in addition to specific toxicity, the presence of Na^+ in the soil may limit plant calcium, magnesium, or potassium uptake, and therefore, result in plant nutrient deficiencies. Plants may also be affected by salinity if soil conditions are degraded and water infiltration and drainage are impaired. Degraded soil conditions may exhibit white or black crusts on the soil surface or wet spots on the soil surface.

. Irrigation water carries salts, and when irrigation water is applied to fields, salts are added to the soil. Salts accumulate in the soil at higher concentrations than they existed in the applied water because evaporation and plant uptake extract water from the soil leaving the salts behind. While salts may accumulate disproportionately in the soil profile depending on soil properties, leaching, irrigation systems, or other reasons, crops respond to the average soil salinity in the root zone (II-15, Ayers and Westcot, 1985).

In August 2016, Dr. Leinfelder-Miles surveyed soil salinity conditions of two permanent crops, grapes and pears, on Ryer Island in the North Delta. The bulk samples from the pear orchard had ECe readings ranging from 0.25 to 1.18 dS/m down the soil profile. The groundwater was at a depth of 1.65 m and had an EC of 0.35 dS/m. Based on these data, the average root zone salinity at this orchard was 0.74 dS/m. (II-22, Brown and Niederholzer (2007)(II-22) indicate that pear yields have been reduced when the average root zone salinity reached 2.5 dS/m; thus, the salinity at this site would not appear to be currently impacting yield.

In the vineyard, which is drip irrigated, the ECe pattern suggests that the wetting front is pushing salts to approximately 90 cm from the vine row and 90 cm deep. This region of both grids has some of the highest salinity of the profile, at or above 4.0 dS/m. the soil is characterized as clay (II-19, Neya et al., 1978). Clays are fine textured soils that have low permeability; thus, the salts appear to be accumulating at the 90-cm depth where infiltration is inhibited by inherent soil characteristics.

The primary management strategy for combating salinity is leaching, and leaching must be practiced when soil salinity has the potential to impact yield (II-15, Ayers and Westcot, 1985). Leaching occurs when water is applied in excess of soil moisture depletion due to evapotranspiration (ET) (II-16, Hanson et al., 2006), or the amount of water that is evaporated from the soil and transpired by the plant. The leaching fraction (Lf) is the fraction of the total applied water that passes below the root zone. The leaching requirement (Lr) is the minimum amount of the total applied water that must pass through the root zone to prevent a reduction in crop yield from excess salts. There are two factors necessary to estimate the Lr, the salt concentration of the applied water and the salt tolerance of the crop.

The yield potential guidelines in Ayers and Westcot (II-15, 1985) assume a 15 percent Lf. Using these guidelines to predict crop response from a given applied water salinity requires an achievable Lf of 15 percent, and when ECw is higher than 1.3 dS/m, the Lf must be higher than 15 percent. While a 15 percent Lf is a general rule of thumb in agricultural systems (II-19, Neya et al., 1978), given the Delta's unique circumstances and constraints, a 15 percent Lf may not always be possible. Soil permeability may be low, water tables are typically around 2 meters from the soil surface, and groundwater quality may be near the salinity thresholds for maintaining crop yield potential. Additionally, perennial crops such as alfalfa, pears and grapes have a high annual ET demand. It can be difficult to apply enough water to meet the ET and Lr of these crops, particularly on low permeability soils like the ones on Ryer Island.

Using soil salinity data gathered on Ryer Island and water salinity data from the California Data Exchange Center (II-42, CDEC, 2016) at Rio Vista – a water quality monitoring station near to the vineyard irrigation water intake on Ryer Island – a Lf can be calculated for the vineyard. In 2016, the achieved Lf at the vineyard was equal to the Lr for maintaining yields. What this means is that we would not expect to see yield declines due to salinity in this situation because the achieved Lf met the Lr for maintaining yields. Had the Lf been lower than the Lr, yields may have been affected. In 2015, using CDEC (II-42) data for the same time period that ranged from 148-3,627 μS/cm (0.148-3.627 dS/m), the average seasonal irrigation water salinity was an ECw of 509 μS/cm (0.509 dS/m).

Calculating the Lr for this higher seasonal applied water salinity, we need a Lr of 7 percent to maintain 100 percent yield potential for grapes. This illustrates that as the seasonal average applied water salinity increases, a higher Lr will be required in order to maintain crop yields. If it is not possible to apply enough water to achieve a 7 percent Lf due to poor soil permeability, proximity of groundwater, or other agronomic considerations , then this higher applied water salinity in 2015 compared to 2016 would suggest detrimental effects on crop yields, increases in the salt load of the soil, or both.

Leaching is the primary means of managing salinity and must be practiced when there is the potential for salinity to impact yield. Soil sampling data from Ryer Island illustrate the inherent low permeability of certain Delta soils, the build-up of salts in the soil to levels that have the potential to affect crop yields, and a low achieved Lf. Salinity will continue to impact Delta agriculture, especially under conditions of higher surface water salinity.

C. Mr. Erik Ringelberg Testimony

Mr. Ringelberg is an environmental scientist with technical and managerial experience in developing, planning, and permitting large projects, assessing their environmental impacts and developing mitigation measure. He has completed numerous analyses of the Bay-Delta Conservation Plan and its various permutations since 2008. He was tasked to assess the proposed California Water Fix Petition for Change before the State Water Resources Control Board to identify from a scientific perspective if the project had potential to negatively affect beneficial uses from increased salinity in the Delta, and if so, what were those potential negative effects.

The salinity gradient in the Delta is controlled by freshwater outflow, and changes constantly due to tides (and monthly and seasonal tidal differences). This gradient movement from the San Francisco Bay into the Delta is most obvious in droughts. Understanding and tracking salinity is accomplished through Electrical Conductivity (EC).

Using averages to describe the salinity at a given location is a compromise of convenience. Since the tides changes daily, there are a range of salinity values expressed over a day. A mean is the average of that range and does not, and is not, intended to describe the ecological or agriculturally important salt concentration. For the ecology, the highest salt concentration (not the average) relates the exceedance of the physiological tolerance range at the organismal level or at the competitive success at the community level. For agriculture, the highest concentration (not the average) of the water diverted for crop use, salinity control and wildlife management can significantly impair productivity and lead to salt buildup. The average can influence the total load of the salt and effect leaching, but it is the absolute instantaneous concentration during irrigation that is critical, not the average.

From the limited summary flow data provided in the application, it appears that the flows immediately downstream of the intakes would be altered in the following manner (DWR-515 and DWR 5 errata, Pg 25-6):

- 6,000 cfs, 300 cfs would be diverted, leaving 5,700 cfs in the river.
- 15,000 cfs, 3,000 cfs would be diverted, leaving 12,000 cfs in the river.
- 22,000 cfs, 9,000 cfs would be diverted, leaving 13,000 cfs in the river.

These flow rules represent a flow reduction up to to 41%. Under these rules, the flow, for the vast majority of the time, would be constrained from 5,700 cfs to 13,000 cfs. These flows are directly equivalent to the range of flows at Freeport during critically dry year (mean 9,345 cfs 1922) to a dry year (mean 16,003 cfs 1989). (II-29, ICF 2016, Pg. 2-3). In plain language, the project rules create a drought-equivalent conditions on the Sacramento River. The project analysis in these same references essentially assert that these are simply operational rules and that the project would be managed dynamically. This is factually correct, but misleading.

As validation of Mr. Ringelber's conclusions regarding diversion flow rules, the scenarios that were provided as illustration of the project modeling analysis archive to the same diversion rates as the maximum diversion rules: 1978, which was also classified as a dry year is modeled with a flow in the river of 14,000 cfs, and a 6,000 cfs diversion, leaving 8,000 cfs in the river with a 43% flow reduction. These rules and their associated modeling illustrate that the project's new point of diversion will reduce flows in the Sacramento River to the same flows as occur in droughts, namely critically dry and dry years. This allows the brackish water to radiate inward into the Delta, but also provides less flushing within the Delta to remove accumulated salts from irrigation, wetlands and wildlife management.

As shown in the provided exhibits, (Ringelberg Attachment A. to II-24) flows at Rio Vista had numerous very high EC values over the past 3 years, but because of the 14-day running average under D-1641 (Figure 1.), and the TUCP, these were not considered to be exceedances in many cases. The salinity intrusion created massive spikes in EC. Those spikes are readily diverted onto agricultural fields for use for irrigation water, ironically salinity control, and for wetland and wildlife management.

Mr. Ringelberg also analyzed defects in the project analysis. He opines that project impacts on salinity are difficult to ascertain because:

1. Use of comparative rather than operational or predictive models to bound changes in EC.
2. Use of model data for D-1641 compliance, not for operational impacts on agriculture.
3. Use of averages, use of old data, and weak calibration, and known errors at low flows and without correlation to contemporary drought conditions.
4. Use of 14-day rolling averages as compliance, instead of actually assessing AGR impairment, LF fraction.

The Project could complete the type of modeling that would demonstrate predictive impacts under operational scenarios that bound the project maximum salinity impacts to the North Delta, but despite repeated requests over several years to do so, DWR still has not provided the necessary information. A bounding scenario would be the months of July-

November, king tide, dry and very dry water year, third and fourth years of drought, Winter Salmon Run temperature protection, 0/1/2 barriers installed. These are not hyperbolic bounds, but are exactly what occurred in the last two years in the Delta.

If operational constraints to protect Delta smelt remain, and are indeed one of the project purposes, the sustained operation of the North Delta diversions would institutionalize permanent drought-like flow conditions, and therefore high EC levels in the Delta. The project's impacts associated with lower flows from the withdrawal of water in the Freeport area, Delta Cross-channel operational impacts (lowering or influencing flows further in the Sacramento River sloughs and Cache Slough complex) will change the circulation and retention of salt, leading to complex interactions throughout the Delta. The project has failed to provide fine scale modeling for key agricultural intake locations within the Delta in support of its conclusions, and even the coarse scale modeling it did provide is insufficient to provide any predictive ability to show that it does not harm beneficial uses and in particular agricultural water users with sensitive crops.

It is Mr. Ringelberg's opinion that the petitioners have not adequately analyzed the project impacts as they relate to salinity intrusion and chronic salinity loading and the impacts that these conditions would create for legal users of water in this part of the Delta. Furthermore it is clear that the petitioners have not substantively addressed the project operational impacts and the potential for individual and aggregate impacts to farms and municipal uses through their diversion of this water should the Waterfix be approved as described.

III. CONCLUSION

The testimony of Mr. Hester and Mr. Lange provide the human face of the people who depend upon the Delta to survive. The concerns expressed about the investment that has been made and potential impacts on that investment are real. Salt intrusion has been a reality during the drought years and the concern is that WaterFix will exacerbate salt intrusion by artificially creating drought flow conditions in the North Delta.

The salinity experts will define the scope of the problem and how the interaction of salts with soil and plants at the molecular level will have a detrimental impact on crops. Removing

41 percent of the flows from the river will duplicate drought conditions for flows and allow more salt intrusion into the Delta. The project applicants have failed properly to analyze the impacts of salt intrusion into the Delta and have also failed to analyze the attendant impacts on agriculture and the water rights of the farmers in the Delta. The Petitioners' attempt to mask the potential impacts on water both in quality and quantity are unmasked when one looks at daily or hourly exceedances and at the quantity of water that will be withdrawn when compared to drought flows of the past several years. The petition should be denied.

September 1, 2016

Respectfully submitted,

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