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BEFORE THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

IN RE CALIFORNIA WATERFIX CALIFORNIA DEPARTMENT OF WATER RESOURCES AND U.S. BUREAU OF RECLAMATION PETITION FOR CHANGES IN WATER RIGHTS, POINTS OF DIVERSION/RE-DIVERSION	**PROTESTANT SAVE THE CALIFORNIA DELTA ALLIANCE, ET Al.'s WRITTEN TESTIMONY OF BRENT HADDAD**

Testimony of Brent Haddad

Summary of Testimony

The energy used to power the A.D. Edmonston Pumping Plant, which pumps State Water Project (SWP) water south over the Tehachapi Mountains, should instead be put to purifying water already located in southern California. Instead, today California creates unnecessary south coast shortages by dumping its water into the ocean, and then replaces it with water pumped from hundreds of miles away. The proposed WaterFix project would lock in this unsustainable approach to water supply for at least another two generations.

The costs associated with the WaterFix Project far exceed its benefits.

A problematic official process of cost-benefit and economic analysis has resulted in water agencies evaluating the WaterFix project with incomplete and misleading economic information. These analyses suggested an economic benefit to the WaterFix project that far exceeded what a properly structured benefit-cost analysis would have shown.

The WaterFix project is subject to risks much greater than is typical of large, complex infrastructure projects. On June 23, 2017, the United States Fish and Wildlife Service issued a biological opinion for the Project, which requires years of further regulatory process before any permit to operate the Project is issued. Project sponsors have no way of knowing what conditions will be placed on the future permits and therefore no certainty that any amount of water will be forthcoming from WaterFix. Yet, Project sponsors are being asked to commit billions of dollars and begin construction before any operating permit is issued or operating conditions are known.

An alternative, that we call the Local Supply Alternative (LSA), provides water at a lower cost compared to the WaterFix project. The LSA is comprised of a number of small water supply and conservation projects located in southern California that cumulatively produce enough water to replace all new supplies provided by the Waterfix, as well as providing for projected demand growth in southern California, and all water pumped through the A.D. Edmonston Pumping Plant to Southern California.

The regulatory risk for cumulative new smaller projects in Southern California is much less than the risk associated with WaterFix, as the WaterFix process has unfolded. The original impetus behind WaterFix (the BDCP) was to obtain 50-year “no surprises” permits early in the process. Instead, only permits subject to modification at any time are even possible at this point.

The environmental benefits of the LSA will likely exceed those of the WaterFix because it would reduce export flows from the Delta, a primary cause of its environmental decline, while also providing environmental benefits to southern California. A significant reduction in exports would add flexibility to the Delta system because pumping would be needed less often. The WaterFix project claims that it also will add flexibility to the Delta system. This claim is not borne out by any project operating criteria.

II. Availability of an alternative supply, the Local Supply Alternative

Quoting from Delta Reform Act of 2009:

> The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in improved regional supplies, conservation, and water use efficiency. Each region that depends on water from the Delta watershed shall improve its regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.

The LSA meets this policy. It utilizes existing water treatment technology, aquifer storage and recovery technology, water conservation technology, water efficiency technology, and data analytics, combined with southern California's changing aesthetic regarding low-water outdoor landscaping, to generate locally-produced and -conserved water sufficient to meet current and future demand and equal to or greater than any supply reasonably to be expected from the WaterFix project.

II.A Supply Quantity Target. To replace the new water yield of the WaterFix Project requires identification of 225,000 acre feet of new water available in Southern California. This new local water supply should exceed what is already expected to be brought on line to meet growth in local demand.

II.A.1 Flows to southern California In order to achieve significant environmental benefits in the Delta region, below we analyze the potential to replace all water supplies currently flowing through the A.D. Edmonston Pumping Plant to southern California with alternative local supplies over a period of 30 years. The Edmonston plant lifts State Water Project water out of the California Aqueduct and over the Tehachapi Mountains. We believe that the energy expended pushing Delta water over the mountains would be better used in desalination and recycling plants in southern California that would produce new water.

Annual SWP deliveries fluctuate greatly. Table 1 shows ten years of SWP deliveries to southern California.

Table 1: SWP Deliveries to long-term Contractors in southern California

Year	Total (AF)
2015	730,853

2014	488,367
2013	1,154,674
2012	1,722,753
2011	2,000,705
2010	1,573,717
2009	1,083,101
2008	1205104
2007	1862607
2006	1906323
Average	**1,372,820**
Min:	**488,367**
Max:	**2,000,705**

Sources: State Water Project Bulletin 132, annual tables in Ch. 9 titled "Water Delivered to Long-term SWP Water Contractors in 20*XX*, by Service Area."

Pumping records are available through the U.S. Geological Survey, and are reproduced in Table 2.

Table 2: Annual water delivers through the A.D. Edmonston Pumping Plant

water year	cfs	afy
1996	1,061	768,130
1997	1,199	868,038
1998	940.5	680,892
1999	1,049	759,442
2000	2,107	1,525,401
2001	1,978	1,432,009
2002	2,277	1,648,475
2003	2,453	1,775,894
2005	2,196	1,589,834
2006	2,591	1,875,801
2007	2,896	2,096,611
2010	1,872	1,355,268
2011	2,365	1,712,184
2012	2,135	1,545,672
2013	1,838	1,330,653
2014	932	674,738
2015	973.8	705,000
AVERAGE:	**1,815**	**1,314,355**
MINIMUM:	**932**	**674,738**
MAXIMUM:	**2,896**	**2,096,611**

Source: USGS Surface-Water Annual Statistics for California, USGS 11109396 CA AQUEDUCT A N PORTAL TEHACHAPI TNL NR GORMAN CA. Years with incomplete records are not included in the table. Downloaded November 28, 2017, from: https://waterdata.usgs.gov/ca/nwis/annual/?search_site_no=11109396&agency_cd=USGS&referred_module=sw&format=sites_selection_links

Table 2 provides flows pumped from the California Aqueduct by the A.D. Edmonston Pumping Plant to southern California. Downstream, the flow splits as it leaves Tehachapi Afterbay. The East Branch California Aqueduct flows through Alamo Powerplant (station 10260776), and the West Branch California Aqueduct flows through William Warne Powerplant (station 11109398).

The combination of actual deliveries (Table 1) and pumping records (Table 2) allow us to identify a target for local water supply replacement. Conservatively rounding the larger numbers up, one should be able to replace on average 1,400,000 acre feet annually**.** If the replacement water is more reliable on an annual basis then one does not need the capacity to occasionally replace the maximum amount of 2,100,000 acre feet – that much water won't be needed to refill local reservoirs if the replacement water is more reliable.

II.A.2 Flows to meet new growth. It is commonplace for water agencies to forecast increasing water demand over time. Forecasting increasing demand growth implies that a region's population and economy both will grow, reasonable assumptions, and that per capita (or per unit of economic output) water consumption will remain the same. These latter two assumptions have been upended over the past 40 years as overall water consumption has leveled off or dropped as populations and the economy have grown. Still, water agencies project increasing demand because it is a conservative planning stance: it is the agency's job to provide sufficient water to the region it serves.

Long term water demand forecasts are almost never accurate. They are almost always overstated. This matters because in this exercise it is prudent to increase the target water consumption of southern California over time, but not necessarily as high as agencies cumulatively estimate their own future demand. That would force us to inaccurately plan for more water supply in southern California than is needed, artificially increasing the cost of the project. With all of these caveats, we proceed with modeling actual demand growth projections.

We project a change in water demand based on a Natural Resources Defense Council examination of published urban water management plans and long-term demand projections in Southern California, reproduced in Table 3 (Obegi, 2017) [SCDA-224[1]].

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[1] SCDA-224 is a true and correct copy of the document Obegi, D. 2017. Issue Brief: Mismatched: A Comparison of Future Water Supply and Demand for the Metropolitan Water District of Southern California and its Member Agencies. (September) IB: 17-08-B. Natural Resources Defense Council. Downloaded November 16, 2017, from: https://www.nrdc.org/resources/comparison-2015-urban-water-management-plans-metropolitan-water-district-southern .

Table 3: A Comparison of MWD Water Demand Projections by Southern California Water Agencies (AF/Y)

	MWD	Member agencies
2020	4,163,000	3,609,401
2025	4,266,000	3,829,722
2030	4,333,000	3,929,601
2035	4,400,000	4,019,548
2040	4,454,000	4,118,715

Source: Table A-2. Obegi, D. 2017 [SCDA-224]. Issue Brief: Mismatched: A Comparison of Future Water Supply and Demand for the Metropolitan Water District of Southern California and its Member Agencies. (September) IB: 17-08-B. Natural Resources Defense Council. Downloaded November 16, 2017, from: https://www.nrdc.org/resources/comparison-2015-urban-water-management-plans-metropolitan-water-district-southern .

MWD projects water demand growing 7% between 2020 and 2040, or 291,000 acre feet per year. The member agencies project demand growing 14%, or 509,000 acre feet per year. Here we split the difference and assume local demand growth of 400,000 af per year. Since MWD only represents 78% of demand south of the plant, we increase this amount to 488,000 acre feet additional demand by 2040.

II.A.3 Total supply required. That means to meet the goal of replacing all water flowing through the Edmonston Pumping Plant, including projected growth in demand, a total of 2,113,000 acre feet per year new supply is required. This amount vastly exceeds the goal of the WaterFix project, but it gets at the heart of the overall goal, to improve environmental conditions in the Delta region.

III. The Local Supply Alternative

III.A Well defined supply augmentation and conservation projects. Table 4 presents a list of water supply projects currently under study or construction in southern California. We start with this list because it has received initial analysis, scrutiny, and approval sufficient to merit further investment and development.

Table 4: Water Supply Augmentation Projects currently being developed in southern California

AFY	Cost/AF	Project Name
4000	200	Carlsbad recycling, multiple options
1400	400	El Toro Phase II recycling
6048	500	Perris II Deslater, Eastern - Phase I recently completed
5585	623	Chino Basin Watermaster / Inland Empire recycling

21000	700	GRIP, Water Replenishment District of Southern California, recycling
56000	1000	Long Beach desalination
33600	1150	GWRS expansion recycling
11200	1200	Ventura County, based on 10 plants expected to join the Salinity Management Program, combined groundwater/desalination/recycling
33600	1200	Rosarito Beach desalination
130000	1350	MWD turfgrass rebate program continuation
67200	1550	West Basin Desalination, largest option
168000	1600	MWD Advanced Purification plant recycling
16800	1611	Doheny Desalination
168000	1700	Camp Pendleton desalination
96320	1700	San Diego, alternatives A1/A2 recycling
67200	1750	Calleguas, additional MWD proposed capacity combined salinity management/recycling
18592	1800	Padre Dam Purification recycling
56000	1900	Huntington Beach Desalination

AFY = acre feet per year.

The projects in Table 4 were identified from general knowledge of supply projects, reviews of California Proposition 1 project funding applications, and reviews of other supply and demand projections. The quantities are from project descriptions and publications. We generated one estimation, continuation of the MWDSC turfgrass rebate program, at 130,000 acre feet per year saved with a at the midrange cost reported for many similar programs. MWDSC describes turf removal as its “most popular conservation measure” (MWDSC 2016, p, 3-36) [SCDA-216[2]]. We did not include the recently-opened Carlsbad Desalination Facility since it already is in operation.

The total amount of water to be created by the projects in Table 4 adds up to 960,545 acre feet per year. All of these projects are feasible and could reasonably be on line by the year 2040.

That means that by 2040, water produced by the LSA could:

- substitute for all new water produced by the WaterFix (225,000 af/year)
- cover all projected demand increases in southern California (488,000 af/year)
- reduce the current rate of pumping at the Edmonston Plant by 19% for a remaining annual average flow of 1,067,000 acre feet per year.

[2] SCDA-216 is a true and correct copy of the document Metropolitan Water District of Southern California, 2016. 2015 Urban Water Management Plan. Downloaded November 17, 2017.

These projects have all been proposed in the absence of a comprehensive plan to develop local water supplies in the southern California region. Their intent is to meet local and regional needs, such as concurrently providing new water while solving water quality, groundwater degradation, supply reliability, and other needs. The seeming ad hoc nature of the list suggests that it is neither the low-hanging fruit nor the exhaustive list of possible water supply and conservation projects. Rather, these happen to be in development at this time. They are suggestive of a trend of increased local water supply production. Because this is the "several small" approach, many projects can be pursued at the same time.

III.B Additional Achievable Projects and Conservation. Now we turn to potential projects that are still based on published analyses, and that we consider to be feasible. This set of projects can be pursued simultaneously with the current projects, within the same 30-year time frame. The total yield reaches well beyond the targeted 2,113,000 acre feet per year so it is not necessary to implement all of the projects to their full potential to replace all water flowing through the Edmonston Plant. The savings are summarized in Table 5. This new set of projects can be pursued at the same time as the above set.

Table 5: Additional Local Supply Potential, Southern California

Category	Potential, AFY	Cost
Conservation	784,000	1,200
Stormwater Capture	300,000	1,100
Water Reuse	300,000	1,800
Desalination	200,000	1,000

Source: cited literature and author's estimations,
AFY = acre feet per year

III.B.1 Conservation. Additional investment incentives for industrial, commercial, and residential water conservation technologies have a strong potential to reduce water consumption. Likewise, a combination of turf rebates and incentives to install outdoor conservation technologies such as evapotranspiration-based controllers and rain sensors in irrigation systems have strong potential.

It appears that over the past five years, a conservation revolution is taking place in southern California. With respect to its SB X7-7 Water Conservation Act of 2009 targets, MWDSC reports in its 2015 Urban Water Management Plan (2016, p. ES-3) [SCDA-216]:

> Based on an analysis of population, demand, and the methodologies for setting targets described in the legislation, Metropolitan's baseline is 181 GPCD and the 2020 reduction target is 145 GPCD. From 2011-2014, there was a slight increase in per capita water use explained in part by continued economic recovery and

> drier weather as compared to previous years. With mandatory restrictions from the state, Water Supply Allocation from Metropolitan and retail water suppliers, the 2015 gallons per capita per day (GPCD) is 131, a 28 percent reduction from the baseline.

This quote has many implications. Going forward, existing demand projections may be too high, meaning sufficient conservation may have already occurred if the baseline was simply connected to population growth. Additional supply projects like the WaterFix, as well as some projects identified here, may already no longer be needed. We believe this is the case.

Another implication is that there is a demonstrated ability for southern California to conserve water. 131 GPCD is not a floor for conservation. It should be seen as the performance achieved on the shoulders of early adopters of water conservation technologies. We note that 131 GPCD is nearly double that of 70 GPCD, the 2015 level of our hometown, Santa Cruz, so there is plenty of room for future conservation to take place.

Assuming that starting from the current per capita water consumption, which is near 131 GPCD, an additional 25 GPCD is conserved beyond what is contemplated in the turf reduction already posited. This amounts to 25 GPCD x 22 million people = 700 million gallons per day, or 784,000 acre feet per year.

This additional conservation could be generated by expanding existing incentive programs and adding new ones. They would be considered additional active conservation measures as described on page 2-7 of the MWDSC Urban Water Management Plan (2016) [SCDA-216]. Conservation programs that currently are part of the SoCal Water$mart program could be enhanced with higher incentive payments and overall funding. We estimate cost of additional active water conservation is to be $1,200 per acre foot. This accounts for the large potential for turf conversion ($1,350) combined with the potential for device-oriented industrial, commercial, and residential savings. This latter value, which is a range covering many different conservation technologies, can be conservatively estimated as costing $500 per acre foot based on analyses from Section 1C.3.3.1.3 of the Final EIR/EIS for the Bay Delta Conservation Plan/California Water Fix, (2016, pp. 1C-32-1C-33) including one range of cost at $333 to $500/acre foot.

In addition to industrial, commercial, and municipal savings, a visual manifestation of this level of conservation will be a new aesthetic favoring native-plant landscaping. Other areas, including Santa Cruz, are well along in this transition. Property values in Santa Cruz are still (too) high, and residents are proud of their low-irrigation landscape.

The potential of conservation measures to reduce future infrastructure needs, as this testimony argues would be the case with the WaterFix, is illustrated in MWDSC's Proposed Water Rates and Charges document (2017d, p. 47) [SCDA-214]:

> Since (1996), Metropolitan has seen the benefits (of conservation programs) materialize. Metropolitan has been able to defer the need to build additional

> infrastructure such as the Central Pool Augmentation Project tunnel and pipeline, completion of San Diego Pipeline No. 6, the West Valley Interconnection, and the completion of the SWP East Branch expansion. Overall, the decrease in demand resulting from these (demand management) projects is estimated to defer the need for projects between four and twenty- five years at a savings of approximately $2.8 billion in 2015 dollars.

Table 5 totals to 1,584,000 acre feet per year, all costs lower than the estimated WaterFix cost of delivered water, though not the current cost of SWP water delivered through the Edmonston pumps. Added to the identified projects, this totals 2,549,000 acre feet per year available via local water supply projects in southern California. Compared to our target of 2,113,000 acre feet per year, which ends southern California's dependence on Delta exports, we exceed our target by 436,000 acre feet per. The remainder ends the need for pumping water through the Edmonston plant by roughly 2040.

III.B.2 Stormwater capture. Southern California counties are investigating how to reduce or mitigate surface water pollution caused by flooding from wastewater treatment facilities or municipal separate storm sewer systems. The Tujunga Spreading Grounds is an example of a project involving stormwater capture, groundwater storage, and beneficial use. A USBR et al. study (2014) [SCDA-223[3]] estimates that by 2035, stormwater capture and reuse systems in the Los Angeles Basin could generate 10,200 acre feet per year of direct use water and 150,100 acre feet per year of water for groundwater replenishment. This is consistent with the City of Los Angeles Stormwater Capture Master Plan (Morin, 2015), issued in 2015, which estimates new water supply from stormwater events between 100,000 and 200,000 acre feet per year by 2035. Since the Los Angeles basin has slightly less than half the population of southern California, and even less of the land area, this estimate could conservatively be doubled to cover all of southern California, to roughly 300,000 acre feet per year of new supply potential. The cost of stormwater capture projects is estimated by the Master Plan to be $600-$1,100 per acre foot.

Stormwater capture is a plausible source of new water because NPDES permits are required for storm events that result in flooding from wastewater treatment plants and municipal separate storm sewer systems (MS4s). Phase II MS4 permit requirements for small cities are in the hearing phase as of November, 2017. Southern California investments in stormwater systems designed only for water quality protection could cost over $1 billion over the next 20 years. By capturing and beneficially using stormwater, otherwise required projects would generate the multiple benefits of meeting regional water quality permit requirements, providing water supply, and reducing impacts of Delta exports on the Delta ecosystem.

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[3] SCDA-223 is a true and correct copy of the document U.S. Bureau of Reclamation, County of Los Angeles Department of Public Works, and Los Angeles Flood Control District, 2014. Los Angeles Basin Stormwater Conservation Study, Task 2: Water Supply and Demand Projections. Downloaded November 28, 2017 from: https://www.usbr.gov/lc/socal/basinstudies/LABasin.html

III.B.3 Water Reuse (Recycling). An NRDC (2014) study estimates that between 800,000 and 1,200,000 acre feet of reuse potential exist along California's coastal regions. Assuming half of that amount is in southern California, and subtracting already identified projects, this results in a roughly 100,000 to 300,000 unrealized potential for water recycling in southern California. This can be contextualized by a projection that in 2040 1,390,000 acre-feet per year of secondary treated effluent will be generated but not treated further at wastewater treatment facilities in the MWDSC service territory (MWDSC 2016, Table 3-8) [SCDA-216]. This is an order of magnitude difference in additional recycling potential. We conservatively choose the upper bound of the NRDC study, 300,000 acre feet per year additional potential.

The cost of expanding water reclamation and reuse, a proven water supply, will be reduced with the adoption of California's Direct Potable Reuse Rules. This could occur before 2020. When implemented, reuse systems can be piped directly to existing water infrastructure. For planning purposes one can assume future costs of water reclamation and reuse should not exceed the Padre Dam cost of $1,800 per acre foot.

Additional water reuse is not likely to encounter public opposition. As MWDSC (2016, p. 3-53) [SCDA-216] explains:

> The drought has heightened water awareness in the region and has provided momentum for water conservation and reuse. The public is more willing to accept alternative supplies such as recycled water. Public outreach and education have also helped improve the public's perception of recycled water. Public sharing of information, open door stakeholder meetings, and focus groups have been very effective at distributing information and addressing public concerns. Case studies and demonstration projects are used to educate and improve public perception on recycled water.

The level of sophistication not only of the technologies but also the communications strategies of water utilities has grown considerably over the past decade, with more programs emerging nation wide as a result.

III.B.4 Desalination. In Table 4, Desalination projects totaling 317,600 acre feet per year are shown to be in preparation in southern California. As described above, with advanced planning, desalination capacity can be expanded over time at the same site at relatively low cost. We conservatively estimate an additional 200,000 acre feet per year supply of desalinated water is available either by expanding existing and planned facilities or by siting new facilities. We estimate the average cost will be $1,000 per acre foot since planned expansions will cost closer to $300 per acre foot and new projects should not exceed $1,700 per acre foot.

With the establishment and operation of water reclamation and reuse facilities and new desalination plants in southern California, implementation barriers to these water supplies have been overcome. These included regulatory/permitting, interest group opposition, technical integration with existing infrastructure, and public acceptance. The Orange

County Groundwater Replenishment System (GWRS), and the Poseidon Resources Carlsbad Desalination Plant both are exemplars of the potential for reclaimed and desalinated water supply. Since opening in October 2010, the GWRS provides 112,000 acre feet per year of near-distilled water to replenish groundwater basins used for municipal customers in Orange County. Launched in December 2015, the Carlsbad facility provides 56,000 acre feet per year to the San Diego County region.

With the growing operational records of numerous recycling and desalination facilities in California and elsewhere, and the completion of California's Title 22 recycled water quality rules for all but direct potable reuse, which are still under development, California water agencies are more confident in pursuing recycled and desalination projects. The state is confident enough to set ambitious targets for expansion of recycled water use. Even regions that previously considered and rejected desalination, such as Santa Cruz, California, are now reconsidering the technology to meet future water supply needs. Based on the experience of these leading facilities, and the large number of proposed and in development water reclamation and desalination facilities in southern California, we have not identified unique barriers to new projects beyond the due diligence and public acceptance requirements expected of any infrastructure project. Overall we do not foresee undue implementation problems to the expansion of local water supply projects.

IV. Interaction and coordination of water saving projects. Some programs are self-reinforcing and others work at cross purposes. Coordination is needed to take advantage of opportunities and avoid inefficiencies. For example, while a large proportion of irrigation water is lost to evapotranspiration, some become captured runoff that would contribute to water recycling. A conservation program would remove that portion of expected inflow to the recycling system. On the other hand, desalination and storm water capture are introducing new water to the system, increasing the potential for additional recycling. New forms of coordination would help the local supply approach achieve additional supply benefits while avoiding unexpected losses.

V. Projects not included in the Local Supply Alternative. Two sources of water supply and conservation have not been considered. First is local mandate-based restrictions on water consumption. Here, water consumption caps and penalties replace increasing block pricing. Until the recent drought this was to us an unthinkable interference on customers' rights to purchase and consume water. However, the social acceptance and success of the 2015 Santa Cruz mandatory drought rationing program suggests to us that very different approaches to how water is paid for by customers could help achieve conservation goals without social upheaval. More broadly, although we have not specified potential savings, "big data" analytics has come to the water sector and agencies are learning a great deal about how their messaging affects consumer behavior. This new knowledge is very likely to result in extremely low cost conservation savings in the future.

Second, we have not considered additional imports to southern California from the Colorado River system or the Mojave Desert. San Diego County and MWDSC have invested in water reliability enhancing programs with Colorado River partners that could potentially be expanded, but we chose instead to focus on local water supply augmentation.

VI. Economic studies of the WaterFix Project

Decisions are being made to support or reject California's largest water infrastructure project ever proposed in the absence of a benefit-cost analysis or a financial analysis. As of November, 2017, major water agencies, including Metropolitan Water District of Southern California (MWDSC) (in support) and Westlands Water District (opposed), have already voted on the project. Yet no formally performed and approved analyses exist (California State Auditor, 2017 [SDCA-210[4]]). The most comprehensive version of the WaterFix's economic analysis is Sunding, 2015 [SCDA-221[5]]. Others include Sunding (2016) [SCDA-220[6]], Mavin (2014) [SCDA-213[7]], and Sunding (2014) [SCDA-222[8]]. Alternative analyses include Michael, 2016 [SCDA-217[9]], Michael, 2013 [SCDA-218[10]], and ECONorthwest, 2011. David Sunding, Ph.D., is a Principal of the Brattle Group and Jeffrey Michael, Ph.D., is Executive Director of the Center for Business & Policy Research (CBPR) at University of the Pacific.

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[4] SCDA-210 is a true and correct copy of the document California State Auditor, 2017. The Unexpected Complexity of the California WaterFix Project Has Resulted in Significant Cost Increases and Delays. (October) Report 2016-132. Downloaded November 28, 2017 from: https://www.bsa.ca.gov/reports/search_results

[5] SCDA-221 is a true and correct copy of the document Sunding, D. 2015. Draft CalWater Fix Economic Analysis prepared for the California Natural Resources Agency by Dr. David Sunding, dated November 15, 2015.

[6] SCDA-220 is a true and correct copy of the document Sunding, D. 2016. California WaterFix Economic Analysis, Slide presentation (October 27).

[7] SCDA-213 is a true and correct copy of the document Mavin, 2014. BDCP vs. local water supply alternatives: Dr. David Sunding reviews the alternative supply analysis for Metropolitan's Bay- Delta committee. Mavin's Notebook Blog post dated July 28. Viewed November 27, 2017 at: https://mavensnotebook.com/2014/07/28/bdcp-vs-local-water-supply-alternatives-dr-david-sunding-reviews-the-alternative-supply-analysis-for-metropolitans-bay-delta-committee/

[8] SCDA-222 is a true and correct copy of the document Sunding, D. 2014, BDCP Costs and Economic Evaluation. California Water Law Conference presentation slides (June 12).

[9] SCDA-217 is a true and correct copy of the document Michael, J. 2016. Benefit-Cost Analysis Of The California WaterFix Center for Business & Policy Research, University of the Pacific (August). Downloaded November 17, 2017 from: *www.pacific.edu/Documents/school-business/BFC/WaterFix%20benefit%20cost.pdf.*

[10] SCDA-218 is a true and correct copy of the document Michael, J. 2013. Comments on the BDCP Benefit-Cost Analysis, (February 6) Downloaded November 17, 2017, from: http://baydeltaconservationplan.com/Library/2007-2014Correspondence.aspx .

This imposes an unfair burden on proponents of alternatives to the WaterFix because proponents must compare their proposals against incorrect or non-existent numbers from abandoned draft documents and public presentation slides.

Because Sunding 2015's analysis, until work was stopped, was the official benefit-cost analysis, we focus our comments primarily on its work and draw from Michael 2016 for contrast.

The costs associated with the extraordinary risks of proceeding with years of construction and billions of dollars of expenditure before any incidental take permits to operate any portion of the project are issued have never been accounted for in any economic analysis.

VI.A Discount Rate. The role of a discount rate in benefit-cost analysis is to account for the potential for money to grow over time, just as money in a savings account does. A discount rate of zero means that a project impact – a cost or benefit – occurring in the distant future counts just as much as an impact occurring today. A "low" discount rate largely preserves the equality between distant and current impacts, while a "high" discount rate values much more highly the impacts felt in the short term over distant impacts. The choice of a discount rate should be explained and justified by the analyst, and general guidance exists, as pointed out in Michael (2013)[SCDA-218], p. 7.

The WaterFix project as modeled accrues its major costs in the early years and its benefits continuously. A "high" discount rate reduces the value of those distant benefits, while a "low" discount rate preserves them. Dr. Sunding (2015) [SCDA-221] selected a discount rate of 3%, while Dr. Michael (2016)[SCDA-217] selected a 3.5% rate. Both are considered "low" rates and therefore favorable to the analysis. General guidance would suggest nearly doubling the rate. Increasing the rate would reduce the current value of the distant benefits of the project, reducing the overall net benefits of both analyses.

VI.B Project Analysis Baseline. In benefit-cost analysis, the baseline is the "business as usual" or "No Project" state of affairs against which the proposed project is compared. The Sunding 2015 financial analysis posits two different business-as-usual base cases. In one base case, an average of the past two decades of exports from the Delta is used to represent future flows. Future Delta exports match historical exports and the costs and benefits of any proposed project is then compared to this base case. This is the standard approach to positing a base case and is the only method used by the Michael (2016) [SCDA-217] analysis.

It is one of two base cases posited in the Sunding (2015) [SCDA-221] analysis. We devote a number of paragraphs to Sunding's second base case because of its ongoing importance to public policy surrounding the WaterFix proposal.

The second Sunding (2015) [SCDA-221] base case is a set of two scenarios. The set emerges from a comparison exercise of program alternatives found in Chapter 9 of the

Bay Delta Conservation Plan (2013a) [SCDA-205[11]]. The purpose of Chapter 9 is to consider options that could reduce the take of covered species as part of DWR's then-effort to obtain an "incidental take permit" as part of the BDCP Habitat Conservation Plan. The set of scenarios, called "Existing Conveyance-High Outflow" (ECHO) and "Existing Conveyance-Low Outflow" (ECLO) were created to serve as comparators for alternative HCP project elements. They were in essence "straw man" futures that facilitate the chapter's discussion of the take mitigation alternatives. In an official brochure (BDCP, 2013d) [SCDA-208[12]] describing Chapter 9, the two scenarios are described:

> The cost of the BDCP and each take alternative are also compared to two reasonable scenarios without the BDCP. For example, without the BDCP, the existing water conveyance (i.e., south Delta facilities) would remain in place and continue to operate as a part of the State Water Project (SWP) and Central Valley Project (CVP). Covered fish populations would be expected to continue to decline. To arrest those declines, operational constraints similar to those of BDCP could be imposed on the existing infrastructure. It is also reasonable to assume that some level of habitat restoration would be required without BDCP to comply with the current BiOps.
>
> These scenarios, called the Existing Conveyance-High Outflow Scenario and the Existing Conveyance Low-Outflow Scenario, are used only in Chapter 9 and only to provide a reasonable comparison point for the cost practicability analysis.

This quote raises red flags with respect to the suitability of the ECHO and ECLO scenarios to serve as a base case in a benefit-cost analysis. ECHO and ECLO tell a story of an expected decline in species followed by "could be imposed" constraints in operating rules, followed by "reasonable to assume" new required habitat restoration.

A brochure explains the highlights of Chapter 9's Appendix 9.a (BDCP 2013e) [SCDA-209[13]]. It spells out the major elements of the two scenarios. A text box reads:

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[11] SCDA-205 is a true and correct copy of the document Bay Delta Conservation Plan, 2013a. BDCP Chapter 9: Alternatives to Take. Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDCP.aspx

[12] SCDA-208 is a true and correct copy of the document Bay Delta Conservation Plan, 2013d. Chapter 9: Alternatives to Take Brochure.
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[13] SCDA-209 is a true and correct copy of the document Bay Delta Conservation Plan, 2013e. Appendix 9.A Economic Benefits of Take Alternatives Brochure. Downloaded

"High-Outflow Scenario
Assumes:
- Operations of existing south Delta water conveyance facilities
- Fall X2 and enhanced spring flows
- South Delta operating restrictions (Scenario 6)
- Implementation of some floodplain restoration in the Yolo Bypass
- Installation of one non-physical barrier

Low-Outflow Scenario
Assumes costs similar to the high-outflow scenario but without fall X2 and additional spring outflows."

"Scenario 6" is implemented in ECHO and ECLO. Scenario 6 was a series of restrictive south Delta operating requirements that were proposed for implementation should the 15,000 cfs WaterFix tunnels be built. Sunding (2016, p. 18) estimates that Scenario 6 operating rules would reduce SWP and CVP shipments by 500,000 acre feet per year. After noting on p. 5 that Scenario 6 is used in the modeling of the WaterFix project's costs and benefits, Sunding (2016) [SCDA-220] p. 6 continues (emphasis added):

> The second baseline assumes existing conveyance and the same operating criteria as the proposed action….This second scenario is **intended to capture the risk of tighter environmental regulations** in the Delta that would be imposed to ensure compliance with the Endangered Species Act and other federal laws and regulations.

The purpose of a base case in benefit cost analysis is not to capture the risk of a possible alternative future. Rather, possible alternative futures are compared to a base case.

Scenario 6 is described in a 2015 comment letter on the BDCP Draft EIR/EIS prepared by the San Luis & Delta-Mendota Water Authority and State Water Contractors (2015) [SCDA-219[14]]:

> (T)he uncertainty of the science extends to so-called "Scenario 6" operations, which is generally defined as south Delta project pumping operations. Scenario 6 was developed within a multi-species planning regulatory framework when a much larger project was being contemplated, including a 15,000 cfs capacity proposed project. The Scenario 6 operations have not been revisited since the shift

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[14] SCDA-219 is a true and correct copy of the document San Luis & Delta-Mendota Water Authority and State Water Contractors, 2015. Comments on the Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement. Submitted October 30. Downloaded November 28, 2017 from: *mwdh2o.com/PDF_About_Your_Water/PWA_JointComment_RDEIR.pdf.*

> to a much smaller 9,000 cfs proposed project and the recent shift to Alternative 4A, under an ESA section 7/CESA 2081 regulatory framework. The following comment on Scenario 6 identifies a number of scientific uncertainties related to the nature and magnitude of any potential species benefit. This scientific uncertainty and disagreement between experts should have been acknowledged in the partially recirculated public Draft EIR/EIS.

This quote is notable because it presents Scenario 6 as outdated, controversial, and originally developed as a proposed operating regime for a larger version of the WaterFix project. Scenario 6 was never formally adopted as the operating rules for the WaterFix project and to our knowledge has never been proposed as an operational regime in the absence of a tunnel project. As such, there is no justification for it to serve as a base case for financial analysis.

In a benefit-cost analysis, ECHO and ECLO would themselves be proposed actions since they require future regulatory decisions and investments. ECHO and ECLO would be compared to an actual base case. They would not serve as the base case itself.

Other Chapter 9 references to the ECHO and ECLO scenarios support this interpretation. Appendix 9.A to Chapter 9 (2013b)[SCDA-206[15]] states,

> These scenarios are used only in Chapter 9, *Alternatives to Take*, and this appendix and only to provide a reasonable comparison point for the cost practicability analysis of the BDCP Proposed Action. The Existing Conveyance High-Outflow Scenario is the basis for comparison with the BDCP Proposed Action High-Outflow Scenario and each of its take alternatives. Similarly, the Existing Conveyance Low-Outflow Scenario is the basis for comparison with the BDCP Proposed Action Low-Outflow Scenario.

The danger in using a base case like this is that its likelihood of actually being realized is very low. Any economic decision made based on such an analysis would not well informed. In this case, a speculative and alarming base case for future water exports is posited as the expected near-future course of events. Following normal benefit-cost procedures is the appropriate method for this project.

VI.C Water Flow Yield Projections.

Table 4 of Sunding (2015) [SCDA-221] dramatically illustrates the difference in water provided by the alternative base cases. Under the correctly-specified base case, the project provides 211,000 new acre feet per year to SWP contractors. In the speculative base case, the project would yield 1,159,000 new acre feet per year to SWP contractors.

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[15] SCDA-206 is a true and correct copy of the document Bay Delta Conservation Plan, 2013b. Public Draft BDCP Appendix 9A – Economic Benefits of the BDCP and Take Alternatives. Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDCP.aspx

The lower yield is consistent with Michael (2016) [SCDA-217] estimated project yield of 225,000 acre-feet per year. This yield can be found in Table 5.A.6-26, Delta Outflow, Monthly Flow, found in Appendix 5.A of the Bay Delta Conservation Plan (2013c) [SCDA-207[16]]. This table summarizes CalSim simulation work comparing the No Action Alternative and the proposed action in terms of the maximum allowable flows under a range of water years. The operating conditions used in the modeling are consistent with the regulatory framework embedded in the WaterFix proposal.

The higher yield, 1,159,000 acre feet per year, is over five times greater than the others. Using this yield, Sunding 2015, p. 31 reads:

> For the SWP, WaterFix preserves 1,220 thousand acre-feet of Delta supplies annually that would otherwise be lost due to sea level rise and other climate impacts. Absent construction of the Delta tunnels, urban contractors would lose over 900 thousand acre-feet of supply across all water year types. MWD alone would lose an average of 641 thousand acre-feet of supply annually, an amount equivalent to over 11 Carlsbad desalination projects.

On October 10, 2017, the MWDSC Board voted to support the WaterFix Project based on the mis-specified baseline and its supply implications. It is highly likely other public agencies have also considered the project using the incorrect supply numbers.

Two notable assumptions are made to arrive at this estimated yield. One, as described above, is that this much water is actually needed from the project because of the restricted exports caused by Scenario 6. The other is found in one of three "white papers" (MWDSC 2017a [SCDA-202[17]], 2017b [SCDA-203[18]], and 2017c[SCDA-204[19]]) produced by the Metropolitan Water District of Southern California, called "Modernizing

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[16] SCDA-7 is a true and correct copy of the document Bay Delta Conservation Plan, 2013c. Appendix 5.a CalSim II modeling and results. Downloaded November 27, 2017 from:
www.westcoast.fisheries.noaa.gov/publications/Central_Valley/.../app_5.a_calsim.pdf

[17] SCDA-202 is a true and correct copy of the document Metropolitan Water District of Southern California, 2017a. Modernizing the System: California WaterFix Finance and Cost Allocation. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/

[18] SCDA-203 is a true and correct copy of the document Metropolitan Water District of Southern California, 2017b. Modernizing the System: California WaterFix Operations. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

[19] SCDA-204 is a true and correct copy of the document Metropolitan Water District of Southern California, 2017c. Modernizing the System: California WaterFix Physical Intrastructure. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

the System: California WaterFix Finance and Cost Allocation," adopts this alternative base case, saying, "California WaterFix is estimated to bring an average water supply yield improvement of 1.3 MAF per year based on a range of 1.2 MAF to 1.4 MAF, ***depending on future regulatory and operating requirements***…" (MWDSC 2017a, p. 15, emphasis added). Setting aside the point that this range is higher than the amount found in Sunding 2015. The WaterFix as proposed combines an engineering project (tunnels) with a commitment to a specific set of water quality and species protection rules, such as SWRCB D-1641. WaterFix as proposed is not meant to capture and deliver as much water as is anticipated by MWDSC. Regulatory and operating rules would have to change for it to operate consistently with the scenario, as highlighted in the MWDSC report. The inability of the project to obtain operating permits thus far suggests that the permitting process will be contested, making a high-volume export result less likely. As discussed earlier, a more likely outcome would be that the future operation of the program will be consistent with how it is currently proposed, yielding 225,000 acre feet per year. It is further possible that additional south of Delta storage facilities would need to be constructed if the project attempts to capture and deliver over one million acre feet annually in successive wet years.

So just as the Scenario 6 base case is speculative, the ability of the proposed WaterFix project to solve the export problems caused by implementation of a Scenario 6 operating regime is also speculative. The reasonable yield numbers are those consistent with the project as proposed, to capture and export surplus flows during high flow periods, which are the maximum 225,000 and 211,000 (to SWP contractors) acre feet per year figures. The higher yield number should be disregarded both because it misrepresents the base case and appears to make assumptions about future project operating conditions and regulations that are not part of the actual proposal.

VII. Project risks

Following is a discussion of WaterFix project risks not identified in the financial analyses.

VII.A Cost overrun potential. Both Sunding (2015) [SCDA-221] and Michael (2016) [SCDA-217] estimate costs in the range of $1.3 billion. The WaterFix would be the largest water infrastructure project ever undertaken in California, and a highly unusual engineering feat. Studies have been undertaken on the cost overrun potential of projects like the WaterFix. Projects of similar scale include Boston's Central Artery/Tunnel Project (the "Big Dig"), the Oakland Bay Bridge Retrofit, and the United Kingdom-France Channel Tunnel (the "Chunnel"). As reported by Flyvbjefg (2007) [SDCA-211[20]], the Big Dig ended up 275% over budget, the Bay Bridge more than 100% over budget, and Channel Tunnel 80% over budget. Numerous other examples of over-budget megaprojects have been documented, from rail lines to dams to sewer systems. A study

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[20] SDCA is a true and correct copy of the document Flyvbjerg, B. 2007. Policy and planning for large-infrastructure projects: problems, causes, and cures. Environment and Planning B: Planning and design 34: 578-97.

of 258 large transportation infrastructure projects (Flyvbjefg et al., 2002 [SDCA-212[21]]) found a 9/10 chance of cost overruns with actual cost averaging 28% higher than estimates. The subset of bridge and tunnel projects had an average cost overrun of 33.8%.

Meanwhile, the State Auditor's October, 2017 report [SCDA-210], titled "The Unexpected Complexity of the California WaterFix Project Has Resulted in Significant Cost Increases and Delays," reports that planning costs alone have already reached $280 million, far exceeding original projections. Based on the above research, the term "unexpected" may not be needed in the report title. The WaterFix project is extremely complex, so cost overruns should be anticipated.

Neither Sunding 2015 nor Michael 2016's analyses add a contingency for cost overruns beyond what is already in the engineering proposals. Yet as the studies above suggest, and as the State Auditor has shown, a project of this size and complexity is very likely to exceed its budget. A 28% overrun in project cost would raise Net Present Cost from $1.3 billion to $1.66 billion, a difference of $360 million dollars. While consistent with the literature, the planning process alone has already consumed much of the difference.

The risk of proceeding without any possibility of obtaining the originally intended 50-year permits and no incidental take permit conditions being known until after billions of dollars have been committed cannot be overstated.

VII.B Risk of a "single large" project. The WaterFix will not deliver a drop of water until it is nearly completed. If for some reason it is not completed, or ceases to operate, the entire investment is lost. In the case of the WaterFix, in addition to the novel engineering challenges, the project is being built in the absence of operating permits. Building a project in the absence of a right to operate it confers additional risk to the project funders. It is currently unknown how much, if any, water will be allowed to pass through the tunnels. There is a significant risk that excess capacity will be built and paid for.

This compares to a "several small" approach to infrastructure in which incremental investments yield incremental water supply. Based on portfolio theory, the likelihood of several small projects in varying locations and using different technologies all failing is much lower than one large project failing. When any one small project fails, it is not catastrophic to the entire supply system.

Another "single large" project risk is that if projected demand is not realized, the project must still be paid for in its entirety. A "several small" approach allows incremental increases in supply to match emerging demand. Desalination provides an example of how this reduces risk. Having initially sized intake and outfall systems with projected growth in mind (meaning larger than is justified by existing demand), the system can be

[21] SDCA is a true and correct copy of the document Flyvbjerg, B., Holm, M., and Buhl, S. 2002. Underestimated Costs in Public Works Projects: Error or Lie? Journal of the American Planning Association. 68(3): 279-95.

expanded or not over time as demand increases simply by adding new pumps and filters. One does not need to build the entire full-scale facility and then wait for demand to catch up with its capacity.

A further problem with "single large" projects is that their cost cannot go down. WaterFix is a single project and will eventually have a single price tag. Meanwhile, there is ample evidence that prices are falling with the expansion of alternative smaller-scale supplies like desalination and water reclamation and reuse. The recently opened (December 2015) Carlsbad Desalination Facility has a cost per acre-foot higher than all the other more recently proposed desalination plants.

A tangible expression of these risks can be found in the accelerating effort to develop local water supplies in southern California, even at costs greater than those offered by SWP-originating water. Water agencies in southern California, especially San Diego County, are willing to pay more for local water compared to imported water.

Every one of these points can be examined quantitatively in the context of the WaterFix vs. an alternative proposal using numerous new local water supplies. The existing analysis does not address them.

VIII. Cost per acre foot of WaterFix water.

The Michael (2016) [SCDA-217] economic analysis sets the cost of water provided by WaterFix at $785 per acre foot (2014 dollars) at the Delta. The Sunding 2015 analysis does not provide a cost estimate using a proper base case. We estimate the cost of WaterFix water per acre foot as follows:

Sunding 2015 project cost divided by total acre-feet produced over 50 years:

$13.25 billion / (225,000 x 50) = $1,178 per acre foot

Per section III.A, a reasonable estimate of cost overruns could inflate this amount by 28%, to $1,508 per acre foot.

This range of cost, $1,178 to $1,508, does not include the cost of conveyance for use in elsewhere in California. Based on the MWDSC "Fiscal Years 2016/2017 and 2017/2018 Cost of Service for Proposed Water Rates and Charges (2017d) [SCDA-214[22]] and MWDSC (2017e) [SCDA-215[23]], we estimate total conveyance and treatment costs to be

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[22] SCDA-214 is a true and correct copy of the document Metropolitan Water District of Southern California, 2017d. Fiscal Years 2016/17 and 2017/18 Cost of Service for Proposed Water Rates and Charges. Downloaded November 27, 2017 from: www.mwdh2o.com/PDF_Who_We_Are/COS%20FY%202017_2018.pdf.

[23] SCDA-215 is a true and correct version of the document Metropolitan Water District of Southern California, 2017e. 2016/17 and 2017/18 Biennial Budget: State Water Project.

$750 per acre foot, of which $400 goes to conveyance and $350 to treatment. Adding this cost to the WaterFix costs brings us to a delivered cost range of $1,928 to $2,258 per acre foot.

IX. Comparative cost, WaterFix vs. Local Supply.

We estimated that water supplied by WaterFix will cost between $1,928 to $2,258 per acre foot. None of the water projects and approaches presented here, ranging from $200 to $1,900 per acre foot, are equal to or higher than this estimate. In this sense, the WaterFix fails a comparative cost test with the LSA project.

The current cost of delivering “No Project” SWP water to southern California, the “base case,” is lower than many of the LSA projects. The cost of water delivered to MWD is roughly $750 (MWDSC, 2017a [SCDA-202]) , in the lower range of the Local Project costs. Yet the more expensive local projects in Table 4 are proceeding anyway, as well many of the projects in Table 5! The reason is that these local supply projects are or will accomplishing numerous other goals besides water supply, such as enhancing local supply reliability, increasing water supply independence, and cleaning up local pollution. The additional value of the projects makes them preferable to delivered SWP water. A case in point is that southern California counties are likely to have a costly regulatory requirement to clean up pollution caused by storm events. This could have a cumulative cost over $1 billion with no added benefit besides the clean up itself. Linking storm water pollution remediation with new water supply, as proposed by the Los Angeles Department of Public Works, generates the multiple benefits of local pollution control, water supply augmentation, and Delta ecological improvements.

X. Environmental Impact Comparison.

As noted in *National Audubon Society v. Superior Court,* 33 Cal.3d 419 (1983), “The state has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible.” The navigable waterways of the Delta fall under the Public Trust Doctrine. When comparing feasible project alternatives, an evaluation of their environmental impact on the Delta is warranted.

The WaterFix program derives environmental benefits from greater management flexibility of Delta water flows to combat flow and salinity problems. Other environmental actions are mitigation measures for construction and alteration activities, in essence zeroing out their impacts.

The LSA provides environmental benefits to the Delta by reducing water exports from the Delta to southern California. The amount of benefit can be calibrated by the number

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of local projects pursued and export water saved. We have identified enough new supply to reduce exports by 1,400,000 acre feet per year, the amount pumped on average through the Edmonston pumping plant. This additional water can be used to improve fish and other wildlife habitats in the Delta, be utilized to accelerate groundwater restoration goals in the Sustainable Groundwater Management Act of 2014, or to other beneficial uses. Because each project goes through its own EIS/EIR process, we can assume local negative environmental impacts have local mitigations, the same as the WaterFix. Many projects, especially those involving stormwater capture and use and groundwater desalting, have substantial additional environmental benefits accruing in southern California.

With respect to energy balance, the benefit of reducing or ending pumping at the Edmonston plant, the largest single energy consumer in California, is in part offset by increased energy use in water treatment for recycling and reuse in southern California. There is also the loss of energy generated at hydropower plants that capture energy from the water as it leaves the Tehachapis. And there is a loss of high quality SWP mixing water that improves the quality of imported Colorado River water arriving in southern California.

We believe the environmental benefits of reducing Delta exports plus reducing surface-water pollution and improving groundwater quality in southern California outweigh the environmental benefits of more precisely managing export timing and location of intake while exporting a greater amount of water from the Delta.

XI. Conclusion

In my considered opinion, based on the foregoing, the WaterFix Project is not in the public interest and its approval in the face of a much better alternative would be unreasonable.

Executed this 30th Day of November 2017

/s Brent Haddad
Brent Haddad

XI. References.

[SCDA-205] Bay Delta Conservation Plan, 2013a. BDCP Chapter 9: Alternatives to Take. Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDCP.aspx

[SCDA-206] Bay Delta Conservation Plan, 2013b. Public Draft BDCP Appendix 9A – Economic Benefits of the BDCP and Take Alternatives. Downloaded November 27, 2017 from:

http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDCP.aspx

[SCDA-207] Bay Delta Conservation Plan, 2013c. Appendix 5.a CalSim II modeling and results. Downloaded November 27, 2017 from: www.westcoast.fisheries.noaa.gov/publications/Central_Valley/.../app_5.a_calsim.pdf

[SCDA-208] Bay Delta Conservation Plan, 2013d. Chapter 9: Alternatives to Take Brochure.
Downloaded November 27, 2017 from:
http://baydeltaconservationplan.com/Library/2011-2014BDCPProjectPlanning.aspx#BrochuresAndFactSheets

[SCDA-209] Bay Delta Conservation Plan, 2013e. Appendix 9.A Economic Benefits of Take Alternatives Brochure. Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/Library/2011-2014BDCPProjectPlanning.aspx#BrochuresAndFactSheets

Bay Delta Conservation Plan, 2016. Final EIR/EIS for the Bay Delta Conservation Plan/California Water Fix. Appendix 1A: Primer on California Water Delivery Systems and the Delta. Downloaded November 28, 2017, from: http://baydeltaconservationplan.com/FinalEIREIS.aspx .

[SCDA-210] California State Auditor, 2017. The Unexpected Complexity of the California WaterFix Project Has Resulted in Significant Cost Increases and Delays. (October) Report 2016-132. Downloaded November 28, 2017 from: https://www.bsa.ca.gov/reports/search_results

Delta Reform Act of 2009. Available at http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920107AB12

ECONorthwest, 2011. Bay-Delta Water: Economics of Choice. Eugene, Ore.: ECONorthwest.

[SCDA-211] Flyvbjerg, B. 2007. Policy and planning for large-infrastructure projects: problems, causes, and cures. Environment and Planning B: Planning and design 34: 578-97.

[SCDA-212] Flyvbjerg, B., Holm, M., and Buhl, S. 2002. Underestimated Costs in Public Works Projects: Error or Lie? Journal of the American Planning Association. 68(3): 279-95.

[SCDA-213] Mavin, 2014. BDCP vs. local water supply alternatives: Dr. David Sunding reviews the alternative supply analysis for Metropolitan's Bay- Delta committee. Mavin's Notebook Blog post dated July 28. Viewed November 27, 2017 at: https://mavensnotebook.com/2014/07/28/bdcp-vs-local-water-supply-alternatives-dr-david-sunding-reviews-the-alternative-supply-analysis-for-metropolitans-bay-delta-committee/

[SCDA-202] Metropolitan Water District of Southern California, 2017a. Modernizing the System: California WaterFix Finance and Cost Allocation. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

[SCDA-203] Metropolitan Water District of Southern California, 2017b. Modernizing the System: California WaterFix Operations. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

[SCDA-204] Metropolitan Water District of Southern California, 2017c. Modernizing the System: California WaterFix Physical Intrastructure. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

[SCDA-214] Metropolitan Water District of Southern California, 2017d. Fiscal Years 2016/17 and 2017/18 Cost of Service for Proposed Water Rates and Charges. Downloaded November 27, 2017 from: www.mwdh2o.com/PDF_Who_We_Are/COS%20FY%202017_2018.pdf

[SCDA-215] Metropolitan Water District of Southern California, 2017e. 2016/17 and 2017/18 Biennial Budget: State Water Project. Downloaded November 28, 2017 from: http://www.mwdh2o.com/PDFWWA2016Postings/FY2017%20SWP.pdf

[SCDA-216] Metropolitan Water District of Southern California, 2016. 2015 Urban Water Management Plan. Downloaded November 17, 2017.

[SCDA-217] Michael, J. 2016. Benefit-Cost Analysis Of The California WaterFix Center for Business & Policy Research, University of the Pacific (August). Downloaded November 17, 2017 from: *www.pacific.edu/Documents/school-business/BFC/WaterFix%20benefit%20cost.pdf*

[SCDA-218] Michael, J. 2013. Comments on the BDCP Benefit-Cost Analysis, (February 6) Downloaded November 17, 2017, from: http://baydeltaconservationplan.com/Library/2007-2014Correspondence.aspx .

Morin, M. 2015. DWP to unveil plan to capture storm runoff. Los Angeles Times (June 25). Downloaded November 29, 2027, from: http://beta.latimes.com/local/california/la-me-stormwater-plan-20150625-story.html

Natural Resources Defense Council, 2014. Water Reuse Potential in California IB:14-05-E (June). Downloaded November 29, 2017, from: https://www.nrdc.org/sites/default/files/ca-water-supply-solutions-reuse-IB.pdf

[SCDA-224] Obegi, D. 2017. Issue Brief: Mismatched: A Comparison of Future Water Supply and Demand for the Metropolitan Water District of Southern California and its Member Agencies. (September) IB: 17-08-B. Natural Resources Defense Council. Downloaded November 16, 2017, from: https://www.nrdc.org/resources/comparison-2015-urban-water-management-plans-metropolitan-water-district-southern .

[SCDA-219] San Luis & Delta-Mendota Water Authority and State Water Contractors, 2015. Comments on the Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement. Submitted October 30. Downloaded November 28, 2017 from: *mwdh2o.com/PDF_About_Your_Water/PWA_JointComment_RDEIR.pdf*

[SCDA-220] Sunding, D. 2016. California WaterFix Economic Analysis, Slide presentation (October 27).

[SCDA-221] Sunding, D. 2015. Draft CalWater Fix Economic Analysis prepared for the California Natural Resources Agency by Dr. David Sunding, dated November 15, 2015.

[SCDA-222] Sunding, D. 2014, BDCP Costs and Economic Evaluation. California Water Law Conference presentation slides (June 12).

[SCDA-223] U.S. Bureau of Reclamation, County of Los Angeles Department of Public Works, and Los Angeles Flood Control District, 2014. Los Angeles Basin Stormwater Conservation Study, Task 2: Water Supply and Demand Projections. Downloaded November 28, 2017 from: https://www.usbr.gov/lc/socal/basinstudies/LABasin.html

XIII. Exhibit List

[SCDA-200] Testimony of Brent M. Haddad, Ph.D.

[SCDA-201] Statement of Qualifications of Brent M. Haddad, Ph.D.

[SCDA-202] Metropolitan Water District of Southern California, 2017a. Modernizing the System: California WaterFix Finance and Cost Allocation. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

[SCDA-203] Metropolitan Water District of Southern California, 2017b. Modernizing the System: California WaterFix Operations. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

[SCDA-204] Metropolitan Water District of Southern California, 2017c. Modernizing the System: California WaterFix Physical Intrastructure. Fact Sheet and White Paper. Downloaded November 27, 2017 from: http://www.mwdh2o.com/DocSvcsPubs/WaterFix/ .

[SCDA-205] Bay Delta Conservation Plan, 2013a. BDCP Chapter 9: Alternatives to Take. Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDCP.aspx

[SCDA-206] Bay Delta Conservation Plan, 2013b. Public Draft BDCP Appendix 9A – Economic Benefits of the BDCP and Take Alternatives. Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/EnvironmentalReview/EnvironmentalReview/2013-2014PublicReview/2013PublicReviewDraftBDCP.aspx

[SCDA-207] Bay Delta Conservation Plan, 2013c. Appendix 5.a CalSim II modeling and results. Downloaded November 27, 2017 from: www.westcoast.fisheries.noaa.gov/publications/Central_Valley/.../app_5.a_calsim.pdf

[SCDA-208] Bay Delta Conservation Plan, 2013d. Chapter 9: Alternatives to Take Brochure.
Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/Library/2011-2014BDCPProjectPlanning.aspx#BrochuresAndFactSheets

[SCDA-209] Bay Delta Conservation Plan, 2013e. Appendix 9.A Economic Benefits of Take Alternatives Brochure. Downloaded November 27, 2017 from: http://baydeltaconservationplan.com/Library/2011-2014BDCPProjectPlanning.aspx#BrochuresAndFactSheets

[SCDA-210] California State Auditor, 2017. The Unexpected Complexity of the California WaterFix Project Has Resulted in Significant Cost Increases and Delays. (October) Report 2016-132. Downloaded November 28, 2017 from: https://www.bsa.ca.gov/reports/search_results

[SCDA-211] Flyvbjerg, B. 2007. Policy and planning for large-infrastructure projects: problems, causes, and cures. Environment and Planning B: Planning and design 34: 578-97.

[SCDA-212] Flyvbjerg, B., Holm, M., and Buhl, S. 2002. Underestimated Costs in Public Works Projects: Error or Lie? Journal of the American Planning Association. 68(3): 279-95.

[SCDA-213] Mavin, 2014. BDCP vs. local water supply alternatives: Dr. David Sunding reviews the alternative supply analysis for Metropolitan's Bay- Delta committee. Mavin's Notebook Blog post dated July 28. Viewed November 27, 2017 at: https://mavensnotebook.com/2014/07/28/bdcp-vs-local-water-supply-alternatives-dr-david-sunding-reviews-the-alternative-supply-analysis-for-metropolitans-bay-delta-committee/

[SCDA-214] Metropolitan Water District of Southern California, 2017d. Fiscal Years 2016/17 and 2017/18 Cost of Service for Proposed Water Rates and Charges. Downloaded November 27, 2017 from: www.mwdh2o.com/PDF_Who_We_Are/COS%20FY%202017_2018.pdf

[SCDA-215] Metropolitan Water District of Southern California, 2017e. 2016/17 and 2017/18 Biennial Budget: State Water Project. Downloaded November 28, 2017 from: http://www.mwdh2o.com/PDFWWA2016Postings/FY2017%20SWP.pdf

[SCDA-216] Metropolitan Water District of Southern California, 2016. 2015 Urban Water Management Plan. Downloaded November 17, 2017.

[SCDA-217] Michael, J. 2016. Benefit-Cost Analysis Of The California WaterFix Center for Business & Policy Research, University of the Pacific (August). Downloaded November 17, 2017 from: *www.pacific.edu/Documents/school-business/BFC/WaterFix%20benefit%20cost.pdf*

[SCDA-218] Michael, J. 2013. Comments on the BDCP Benefit-Cost Analysis, (February 6) Downloaded November 17, 2017, from: http://baydeltaconservationplan.com/Library/2007-2014Correspondence.aspx .

[SCDA-219] San Luis & Delta-Mendota Water Authority and State Water Contractors, 2015. Comments on the Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement. Submitted October 30. Downloaded November 28, 2017 from: *mwdh2o.com/PDF_About_Your_Water/PWA_JointComment_RDEIR.pdf*

[SCDA-220] Sunding, D. 2016. California WaterFix Economic Analysis, Slide presentation (October 27).

[SCDA-221] Sunding, D. 2015. Draft CalWater Fix Economic Analysis prepared for the California Natural Resources Agency by Dr. David Sunding, dated November 15, 2015.

[SCDA-222] Sunding, D. 2014, BDCP Costs and Economic Evaluation. California Water Law Conference presentation slides (June 12).

[SCDA-223] U.S. Bureau of Reclamation, County of Los Angeles Department of Public Works, and Los Angeles Flood Control District, 2014. Los Angeles Basin Stormwater Conservation Study, Task 2: Water Supply and Demand Projections. Downloaded November 28, 2017 from: https://www.usbr.gov/lc/socal/basinstudies/LABasin.html

[SCDA-224] Obegi, D. 2017. Issue Brief: Mismatched: A Comparison of Future Water Supply and Demand for the Metropolitan Water District of Southern California and its Member Agencies. (September) IB: 17-08-B. Natural Resources Defense Council. Downloaded November 16, 2017, from: https://www.nrdc.org/resources/comparison-2015-urban-water-management-plans-metropolitan-water-district-southern .