Clean, Sustainable and Reliable Water Supply: Alternatives to the Giant Bay Delta Tunnels

By: Sierra Club California Water Committee, December 2013

California needs a statewide water policy that gives all Californians adequate clean drinking water; respects and protects our rivers, streams, bays and deltas; and supports a sustainable economy. We need an approach that recognizes the water supply and demand challenges that will come with global climate change and population growth. One that offers responsible, cost-effective solutions.

The Bay-Delta Conservation Plan (BDCP), through which the Brown Administration proposes to move unknown new amounts of water out of the sensitive San Francisco Bay Delta, is not the right plan for the 21st Century. It would create a costly pair of giant tunnels to divert Delta-bound water directly from the Sacramento River. It would accelerate the decline of the largest estuary on the West Coast of the northern hemisphere, a key component in the state's fishing industry and rich wildlife biodiversity. It would do nothing to reverse the damage related to the flow change created by the existing Tracy pumps. It recycles an old idea voters rejected decades ago, during an earlier Brown Administration, when they rejected the Peripheral Canal. It will burden Californians statewide with the financial and environmental impacts of an unnecessary and costly construction project that ultimately won't fix the state's water problems.

Photo by Suzanne Hambleton

The Sierra Club opposes the proposed tunnels. Instead, we believe Californians should pursue a range of strategies that together will sustainably meet water needs while protecting the environment.

The Delta's Multi-faceted Role in California

The San Francisco Bay Delta is the freshwater body formed where the Sacramento, San Joaquin and several smaller rivers meet, near the city of Stockton. Snowmelt from the Sierra Nevada mountain range in Northern California flows down the rivers and through the Delta on the way to the Suisun and San Francisco bays, before emptying into the ocean at the Golden Gate Bridge. The Delta and the two bays constitute the largest natural estuary on the West Coast, covering more than 1,100 square miles, an area about three times the size of the City of San Diego.

The Bay Delta is vital to the California economy. Massive pumps operated by the federal and state water projects near the San Joaquin County town of Tracy deliver water supplies from the Delta to 70 percent of the state's urban population and to much of the intensive agriculture in the southern half of the Great Central Valley.

The Bay Delta ecosystem has collapsed

because of excessive water diversions, introduced nonnative invasive species, and water pollution. As water exports out of the Bay Delta have grown, populations of critical fish species that live in or migrate through the Delta have crashed.

Since 1990, the amount of water that has been pumped out of the Delta has increased from an average of about 3.0 million acre-feet per year to over 5.2 million acre-feet. (A single acre-foot of water is 325,000 gallons, or enough water to serve two households for a year.) The number of salmon migrating back from the ocean through the Delta to spawn in Northern California rivers plummeted between 1990 and 2010. The commercial salmon season had to be cancelled from 2008 to 2010 because there were not enough spawning salmon.

The Foundation for Water Solutions for the 21st Century

The western United States has faced severe droughts in the past decade, exacerbated by climate-change-driven heat waves. California experienced in 2013 the driest year since record keeping began in 1895. The old solutions to water supply—huge inter-basin transfers starting with the Owens Valley in Inyo County to Los Angeles; and the construction of mega-dams on the state's major river systems, including Shasta and Trinity dams on the Sacramento, and Friant and New Melones dams on the San Joaquin—won't work in the new era.

New solutions that can simultaneously deliver sustainability and reliability are in order.

With this document, Sierra Club California presents alternatives to the tunnels proposal. The list of alternatives in this document is not exhaustive, but it demonstrates that there are reasonable ways to meet California's water demand without building the tunnels.

This plan, drawn from existing literature and experience, sets out the essential elements for California water management that will help us adapt to climate change, population pressures, and economic shifts—without sacrificing the natural environment. In this context, "sustainability" means we maintain environmental resources and moderate our water use, over time, accordingly. "Reliability" means adjusting the supply and use over time, sustainably, in response to varying hydrology and socio-economic changes.

Our alternative plan proposes managing supplies in a way that sustains beneficial uses, including environmental uses, and safeguarding the water needs of the natural environment while also avoiding hardship to humans due to shortages. This plan is based on three key principles.

First, there is no new water. What water agencies once called "new" water was a transfer from nature to human—either removed from natural water bodies or from groundwater aquifers. The impacts of this "new" water development are now painfully clear: degraded rivers, loss of species, groundwater overdraft and ground subsidence. It is time for focused stewardship of our existing developed supplies through measures such as conservation, reuse, groundwater restoration and management, and preservation of water quality and quantity. We will also need to devise ways to adapt to changing uses and

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users.

Second, environmental protection is essential. Clean, abundant water and public health depend upon a healthy environment. Water diversions and groundwater withdrawals must be consistent with maintaining a healthy environment and adapting to climate change. In the future, climate change and state population growth will add to stresses on commercial fisheries and other aquatic resources. To sustain and recover our aquatic environment, we can no longer afford to deplete first and study later. Also, renewed support for California's water regulatory system, especially rules and regulations promulgated by the State Water Resources Control Board, is required.

Practically speaking, this means that protection for essential river flows, including Bay Delta outflows, should be a precondition for future withdrawals and exports. The Bay Delta needs more water, not less, for environmental functions—higher flows into and through the Delta, and out into the San Francisco Bay.

In 2010, the State Water Resources Control Board released proposed flow requirements for the Bay Delta estuary, calculated as percentages of natural or unimpaired flows. According to the board, to preserve the attributes of a natural variable system to which native fish species are adapted, 75 percent of unimpaired Delta outflow must be guaranteed from January through June every year. In comparison, historic flows over the last 20 years have been approximately 30 percent unimpaired flow through the Bay Delta in drier years to almost 100 percent of unimpaired flows in wetter.

Third, we must adapt our water delivery systems to prepare for climate change. With climate change, the state's water supply will become even more erratic. Weather patterns are expected to become more extreme with long, multiyear droughts becoming more frequent. The Department of Water Resources reports that by 2050, temperature increases of one to three degrees Celsius are expected to cause more winter precipitation to fall as rain, as opposed to snow, and to reduce the Sierra Nevada snow-pack (the source of much of California's runoff) by 25 to 40 percent. 100 percent of unimpaired flows in wetter.

1. **There is no new water.**
2. **Environmental protection is essential.**
3. **We must adapt our water delivery systems to prepare for climate change.**

The Alternative Approach

California can meet its water demand sustainably and reliably by focusing investment in recycling, conservation, water efficiency, and better groundwater management for both urban and agricultural users. These strategies focus on developing local and regional water savings and supplies, which can dramatically reduce the current reliance on Bay Delta surface water exports.

Below, we briefly describe some of the fledgling conservation programs that have been initiated. We propose new

investments in these proven water saving strategies. These alternatives reflect a sampling and not an exhaustive list. But what we have included demonstrates that California can and should wean itself from high Delta exports and not build the tunnels. State policies must support and encourage these investments in California's future.

Notably, these local and regional approaches to improve water efficiency and conservation create good jobs. In a 2011 report, the Economic Roundtable estimated that water efficiency measures in Los Angeles creates more jobs per million dollars invested than either motion picture and video production or housing construction.

The State of California already acknowledges the feasibility of these conservation programs. However, the political will to fund and implement them on a wide scale throughout the state is lacking. As noted in the *2013 Delta Plan*, adopted by the Delta Stewardship Council, the Department of Water Resources estimates that the state could reduce water demand and increase water supplies in the range of five to ten million acre-feet per year by 2030 through the use of existing strategies and technologies (see Table 1, below). If the state developed only half this water (about five million acre-feet) through water efficiency and new local supplies, it would be sufficient to support the addition of almost 30 million residents, more than the population growth that is expected to occur by 2050. This means that water savings from water reclamation and other programs yields approximately as much "new water" savings as is currently exported from the Bay Delta.

Nearly all these potential supplies will come from a combination of strategies. These include: improved conservation and water use efficiency in the urban and agricultural sectors; local groundwater and surface storage; conjunctive management; recycled water; drinking water treatment; groundwater remediation; and groundwater desalination.

The *Delta Plan* further notes that,

POTENTIAL WATER SAVINGS/SUPPLIES FROM VARIOUS CONSERVATION PROGRAMS

Conservation Program	Water Savings/Supplies (million acre-feet/year)
Urban Water Use Efficiency	up to 3.1 MAF
Recycled Municipal Water	up to 2.3 MAF
Conjunctive Management and Groundwater	up to 2.0 MAF
Agricultural Water Use Efficiency	up to 1.0 MAF
Ocean and Brackish Desalination	up to 0.4 MAF
Other	up to 0.9 MAF
TOTAL	**up to 9.7 MAF**

Source: California Dept. of Water Resources, 2009, as cited in *Delta Water Plan*, 2013 (Figure 3.7)

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"Often, the new local and regional water supplies have the additional advantage of being available even during extreme drought conditions, making them some of the most reliable sources of water for urban and agricultural uses. In particular, recycled water and the treatment and reuse of poor-quality groundwater are two of the most resilient water supplies under conditions of drought and climate change. The treatment of poor-quality groundwater also can significantly improve drinking water supplies, especially for rural and economically disadvantaged communities that have limited alternatives to secure clean water."

URBAN WATER CONSERVATION

The foremost, least expensive, least energy-intensive, and environmentally safe way to meet California's future water needs is through conservation and public education. With existing technology as well as new landscaping, plumbing, metering, and green building ordinances, the potential for water savings has increased over the years. The Pacific Institute states that with current technology only, California has the means to save more than 2.3 million acre-feet per year through conservation.

Water conservation programs will require additional public investment. According to the Portfolio-Based BDCP Conceptual Alternative proposed by the Natural Resources Defense Council and other organizations, a $2 billion investment in water recycling and a $3 billion investment in water conservation could yield approximately 310,000 acre-feet from water recycling and 900,000 acre-feet from urban water efficiencies. These wise investments are a relatively small down payment to reach water sustainability in California, compared to the huge public investment required for construction and operation of the twin tunnels. The Sierra Club supports legislation to create a funding source for conservation programs (e.g., a state excise tax on water, similar to that proposed in legislation in 2001, Senator Joe Simitian's SB 34).

There is still much opportunity to increase water supplies through improved technologies for conservation: graywater re-use, industrial recycling, and groundwater desalination techniques. A focus on improving home-grown technologies in these areas could build upon the water conservation technology sector already active in California and could provide economic benefits. Policies that reinforce use of these new technologies should be employed and expanded. A few of these policies include:

Ensuring adequate water supply. Existing California regulations that require proof of an adequate water supply for new development growth projects could be tightened. For example, the requirements of SB 610 and SB 221 (water supply analysis to comply with the California Environmental Quality Act) could be strengthened so the laws apply to projects with fewer than 500 residential units. This would be a stronger check on urban sprawl that relies on unsustainable water sources.

Limiting landscaping water use. On average, outdoor water use accounts for more than 40 percent of the water consumed in urban areas in the state. This includes lawns, landscaping, parks, golf courses, and cemeteries. But in Los Angeles, outdoor use accounts for 70 percent of residential

uses. It is no secret that the City of Los Angeles has lowered its per capita water demands to a level below what it was 20 years

ago through public education and conservation, even though there has been an increase in population. Most of the reductions have been made by retrofitting buildings and encouraging the use of xeriscaping. Most water use occurs outside, so the potential for greater water conservation must happen there.

In 2006, California adopted a new law that requires landscaping plans for new subdivisions to calculate water demand and limit water usage. These landscaping rules have not been widely embraced by local jurisdictions. The Legislature should revisit the existing program and determine if changes are required to ensure it applies to all areas of the state and it reaches the maximum water savings.

Graywater peaches. By kqedquest.

Capturing Rainwater. Passage of the Rainwater Recapture Act of 2012 allows residential users, and other private and public entities, to capture and use rainwater harvested from rooftops, which reduces reliance on potable water for landscaping needs and provides a recharge benefit to underlying groundwater aquifers. The Statewide Water Efficiency Landscape Ordinances require or encourage new landscapes greater than 2,500 square feet to keep and filter rainwater onsite.

Collecting the first quarter inch of rain from a 1,000 square foot roof can produce as many as 150 gallons. A single 55-gallon rain barrel will only catch about 10 percent of the 9,600 gallons of water generated in a typical year by an average 1,000-square-foot residential L.A. rooftop. However, if each of the 800,000 residential parcels in L.A. were to install just one single rain barrel, the city estimates about 800 million gallons of water would be saved per year.

Reusing Graywater. Graywater can make up a good portion of residential wastewater. Graywater is primarily the byproduct of household water used for washing. This would include water from sinks, showers, bathtubs, and washing machines. A graywater system gives the homeowner the ability to use this wastewater to irrigate landscaping and, in doing so, conserve the drinking water that would have been used to water the landscape.

With a graywater system, homeowners could re-use up to 80 percent of this water to irrigate plants and trees within their property, saving up to 50,000 gallons a year. A graywater system uses gravity (which limits energy use) to move water from the

home to mulch basins, which re-distribute the water where it is needed while preventing it from escaping, where it would be wasted. The potential savings of graywater systems could be made even greater with more simplified permits for residential consumers.

Desalination of brackish groundwater. The opportunities are great for providing water supply from brackish groundwater desalination as well as recovering contaminated groundwater. Brackish water desalination can provide significant value and numerous benefits. These include replacing water lost from other sources, relieving drought conditions, and replacing water that can be used for river and stream ecosystem restoration.

Although most estimate that desalination will contribute less than 10 percent of the total water supply needs in California, this still represents a significant portion of the state's water supply portfolio. There are currently more than 40 brackish groundwater-desalting facilities in California that generate approximately 170,000 acre-feet per year (counting both reverse osmosis and ion exchange desalting). An additional 30 to 35 brackish groundwater desalting facilities that could generate nearly 290,000 acre-feet per year are envisioned during the next decade.

Fixing aging infrastructure. California could use $44.5 billion to fix aging water systems over the next two decades, according to a federal survey that placed the state at the top of a national list of water infrastructure needs. Water systems across California are not meeting the basic obligation to provide a reliable supply of clean water. Pipes that deliver drinking water are rusting, clogging, and cracking, and reservoirs are losing storage capacity. The steps to supply running water to virtually every household in California represent diligent investments in reservoirs, pumps, pipes, and treatment plants that began in the 19th and early 20th centuries. Now many of those systems—neglected for decades — are in need of maintenance and repairs.

URBAN WATER RECYCLING

We can and must increase water supplies statewide by recycling most municipal wastewater for potable and non-potable reuse. With increased population growth, recycled sources of water must be used to meet demand. Reclaimed or recycled water comes in second only to water conservation as the biggest "new" source of water in our alternative water plan.

California's water agencies and communities have been recycling water for decades with great success. With increased expansion of recycling to include most municipal wastewaters and better technology, imported water or reliance on the San Francisco Bay Delta can be dramatically reduced. (It should be noted that some municipal wastewaters are not appropriate for recycling because of unregulated contaminants, such as drug and hospital wastes, which must be better regulated.)

The State Water Resources Control Board has set goals for the state to reach two million acre-feet of recycled water by 2030. According to the California Department of Water Resources, currently only about one-half million acre-feet of wastewater are recycled each year. About half of that is used for agricultural irrigation.

Southern California is already forging ahead with water reclamation, but other parts of the state have been slow to follow. In August 2013, the Water Replenishment District of Southern California and the Sanitation Districts of Los Angeles County signed a 30-year recycled water purchase agreement that will eliminate the need to import water from Northern California and the Colorado River for groundwater recharge. In Orange County the aquifers are replenished daily with 70 million gallons of treated effluent. In Los Angeles, 20 percent of treated water is reused mostly as a saltwater intrusion barrier. The other 80 percent is pumped out into the ocean. In San Diego, the regional water treatment plant produces 100 million gallons per day, while the people of San Diego use 235,000 acre-feet per year or 250 million gallons per day of potable water. Recycled water in San Diego is used primarily for irrigation.

A report from the National Academy of Sciences said that if coastal communities used advanced treatment procedures on the effluent that is now sent out to sea, those communities could increase the amount of available municipal water by as much as 27 percent.

AGRICULTURAL WATER EFFICIENCY

Because agriculture uses the majority of California's water—about 80 percent of the average annual use - agricultural conservation efforts can yield significant water savings. Preparing for less surface water supplies from the Bay Delta and elsewhere will require new management techniques and more capital investment.

Farmers have become more efficient over the last decades. The Department of Water Resources estimates that total crop-applied water fell by 15 percent between 1967 and 2007. But more needs to be done.

Flood irrigation is still a primary watering technique in California. It uses an average of 13.5 million acre-feet per year. The U.S. Natural Resources Conservation Service provides a 50 percent discount when farmers install drip irrigation systems, which provide a greater than 20 percent savings of water with pressurized irrigation systems. Online journalist Deanna Lynn Wulff reports that reducing water demand on flood irrigated crops by just 20 percent would equal nearly three million acre-feet per year.

In addition, modernizing the infrastructure of agricultural water districts can produce huge water savings. For example, the Oakdale Irrigation District has an annual operational water loss of approximately 100,000 acre-feet per year. Most of these losses come from on-farm losses (45-55 percent), canal seepage (32-38 percent), and spills (17-22 percent). If the district was able to reduce spills by 75 percent, it would generate 15,000 acre-feet in water savings, according to Wulff.

Related to the goal of increasing agricultural water efficiency is the issue of reclaiming and retiring degraded lands for other more sustainable uses. The concept of buying degraded farmland and its water rights for partial or complete fallowing in order to further environmental goals deserves consideration. For example, the state or a consortium of entities could consider buying out 100,000 drainage-impaired acres contaminated by selenium in the Westlands district

of western Fresno County, which is a prime location adjacent to the major interties to the state electrical grid, to encourage solar farm development.

The use of water transfers is another issue that deserves greater legislative scrutiny and oversight. Transfers of agricultural water from the Sacramento Valley to other agricultural districts in the San Joaquin Valley are occurring with greater frequency, especially during drought periods. Transfers between agricultural districts and urban agencies also occur. The state should establish rules and regulations to ensure that the environmental and economic impacts of water transfers are analyzed and mitigated appropriately. Water transfers that serve urban growth must be consistent with regional plans.

MANAGING GROUNDWATER SUSTAINABLY

As noted in the *Delta Plan*, more than 40 percent of Californians rely on groundwater for part of their water supply, and many small- to moderate-sized towns and cities are entirely dependent on groundwater for their drinking water systems. The state's most significant groundwater use occurs in regions that also rely on water from the Delta watershed, including the San Joaquin Valley, Tulare Lake, Sacramento Valley, Central Coast, and South Coast. The Tulare Lake region alone, in the southern San Joaquin Valley, accounts for more than one-third of the state's total groundwater pumping, according to the Department of Water Resources.

Because of historical groundwater overdraft and resulting land subsidence experienced in these regions, water users switched to using surface water when the Central Valley Project and the State Water Project were completed in the late 1960s. However, groundwater pumping and overdraft became more severe as water demands continued to exceed available supplies. Satellite imaging published by Jay Famiglietti, of the University of California Center for Hydrologic Modeling, and others reveals that the Central Valley lost approximately 25 million acre-feet of stored groundwater during the period of October 2003 to March 2010.

"California is one of the last states in the nation not to regulate groundwater. That has to change," said the *Sacramento Bee* in a recent editorial. We agree. The Sierra Club strongly supports policies to extend mandatory groundwater monitoring and reporting plans to all parts of the state. Failure to coordinate and moderate groundwater withdrawals has led to levels of unsustainable water use, damage to aquifer storage capacity, and land subsidence.

The amount of groundwater that is at risk, and could be used more efficiently, is huge. Although the Bay Delta is a major source of water supply for California (approximately five million acre-feet per year), the Bay Delta supply is less than the amount of groundwater that is pumped annually by farmers (approximately eight million acre-feet). The State Water Board estimates that more than 30 percent of California's water for agriculture and urban use is pulled from the ground and reliance on groundwater increases to 40 percent during dry years when surface water supplies shrink.

We have a crisis building in the state. Groundwater reserves that could be a critically needed resource in times of

drought for both farms and urban customers are shrinking. The Pacific Institute reports that groundwater is being depleted at a rate of 4 million acre-feet per year.

The problem is especially critical in the San Joaquin Valley. It is estimated that groundwater reserves are shrinking by 800 billion gallons per year in the Central Valley. "At 100 gallons per day, that is enough water to supply the needs of nearly 22 million people each year," Famiglietti told the Modesto Bee in November 2013. "People need to truly understand groundwater is disappearing....Without intervening, that water is not coming back."

The Future Can Be Brighter

California's water supply problems can be addressed without building the giant Delta tunnels. There are many alternatives to the tunnels that will give Californians water supply security that the tunnels won't produce. The alternatives will also help protect the environment.

We have presented just a sampling of strategies that can help Californians create a brighter, more sensible water future in the state. We hope this provides inspiration to the public, water agencies, industry and state political leaders to reject the Delta tunnels proposal and forge a smarter path for California.

Enjoying the Delta. Photo by Liz Henry