Danger on the Delta

Is Southern California Betting Its Future on an Unstable Water System?

On March 13, 2007, the Aquarium of the Pacific sponsored a half-day conference and workshop to explore the topic, "Danger on the Delta: Is Southern California Betting Its Future on an Unstable Water System?" The timing was triggered by the publication of the book, "The Edge of Disaster: Rebuilding a Resilient Nation" by Stephen Flynn, that contains a chapter on the Sacramento-San Joaquin Delta entitled "Danger on the Delta", and on Flynn's offer to give a public lecture on this chapter, and to participate in the conference.

The conference strategy consisted of an opening plenary of introductory information provided by Stephen Flynn, Keith Coolidge (Deputy Director of CalFed) and Robert Wilkinson (Director of Water Policy Program, UCSB) followed by a series of breakout sessions built around the various options for replacing the water from the Delta if and when the Delta supply is cut off. The conference reconvened in plenary and each working group gave a summary of its discussion followed by response from a policy panel. The desired output for the conference was an explicit identification of the range of options available to southern California to enhance its water supply in the event of the loss of water from the Delta, and to have a rudimentary analysis of these options. The desired outcome is that the conference will lead to a rigorous and balanced analysis of these options so that southern California's portfolio of water sources is made more secure. This document summarizes the major points made during the conference. We have tried to reflect the views expressed during the conference, but have gone back to the experts to ensure scientific and technical accuracy. It should be pointed out that not only is southern California's water supply at risk. The Bay area's dependence on the Delta for its water is even greater and more vulnerable than southern California.

Setting the Stage

THE DELTA PROVIDES TWO-THIRDS of all Californians with at least some of their potable water. The Delta (State Water Project -- SWP) provides the Metropolitan Water District (MWD), on average, with about 60% of its total water supply. During extreme droughts, the percentages may drop to as low as 12%, although the MWD would withdraw substantial amounts of Delta water that had been stored previously. Over the past few years, the Delta (SWP) has accounted for 70% or more of the total MWD supply. The Delta provides about one-third of the total supply to the entire southern California region.

The stability of the Delta is increasingly becoming compromised. The State's recent infrastructure bond bill (Proposition 1E) will provide up to $4.1 billion to stabilize some of the approximately 700 miles of levees within the Delta, but a significant fraction of the funds will be spent on levees in the Sacramento area. All levees are earthen, made of mixtures of sand, silt, clay, and peat. The investment will stabilize the levees against river flooding and sea level rise, but will not provide any measurable improvement in stability against a major earthquake within the Delta region. The United States Geological Survey estimates that there is a 62 percent probability that an earthquake of at least magnitude 6.7 or greater will strike the San Francisco Bay region by 2032. Such an earthquake would lead to liquefaction of many of the levees. The Delta would be flooded with salt water from San Francisco Bay and the supply of water to southern California interrupted for anywhere from six months to two years.

A consortium of state, local, and non-governmental agencies is working to develop a long-term solution to the problems posed by the instability of the Delta, but it is likely that any such fix would be a decade or more away and would face several major obstacles that would need to be overcome before it could be implemented.

Environmental changes now occurring are exacerbating the risks of a Delta failure. These include accelerated sea level rise, decreasing snow pack, increased precipitation and other factors associated with global climate change, and subsidence of the Delta. Given this high probability of the loss of a major source of California's fresh water, an evaluation of the alternatives to replace this lost water seemed like a prudent thing to do. The options that were identified and evaluated were

- Increased conservation
- Increased storage and groundwater pumping
- Reclamation and reuse of municipal wastewater
- Reclamation and reuse of agricultural water
- Capture and reuse of urban runoff
- Increased deliveries from the Colorado River
- Ocean desalination

For six of the seven options, two experts were identified and asked to come to the conference with a preliminary assessment of how much each option could supply on a sustainable

Advisory Panel

- Michael S.Conner, *San Francisco Estuary Institute*
- Ronald Gastelum, *Attorney, Aquarium of the Pacific Board*
- Russ Hill, *Halbert, Hargrove/Russell LLC, Aquarium of the Pacific Board*
- Richard Katz, *Richard Katz Consulting, Inc.*
- Mary Nichols, *UCLA Institute of the Environment*

Conference Speakers

Opening Speakers

- Jerry Schubel, *President, Aquarium of the Pacific*
- Keith Coolidge, *Deputy Director of Communications, California Bay-Delta Authority*
- Stephen Flynn, *Author, The Edge of Disaster*
- Robert Wilkinson, *Professor, UC Santa Barbara*

Closing Policy Panel

- Randall Crane, *Professor, UC Los Angeles*
- Stephen Flynn, *Author, The Edge of Disaster*
- Ron Gastelum, *Attorney, Aquarium of the Pacific Board of Directors*
- Keith Coolidge, *Deputy Director of Communications, California Bay-Delta Authority*

Options & Experts

Increased Conservation

- David Olson, *Irvine Ranch Land Reserve Trust*
- Lynn Lipinski, *Metropolitan Water District of Southern California*

Reclamation and Reuse of Agricultural Water

- Yoram Cohen, *UC Los Angeles*
- Steve Grattan, *UC Davis*

Reclamation and Reuse of Municipal Wastewater

- Richard Atwater, *Inland Empire Utilities Agency*
- Bill Jacoby, *San Diego County Water Authority*

Capture and Reuse of Runoff

- Celeste Cantu, *Santa Ana Watershed Project Authority*
- William Cooper, *University of California, Irvine*

Increase Storage and Groundwater Pumping

- Don Kendall, *Calleguas Municipal Water District*

Increased Deliveries from the Colorado River

- Bill Hasencamp, *Metropolitan Water District of Southern California*
- William Steele, *Bureau of Reclamation*

Ocean Desalination

- Peter MacLaggan, *Poseion Resources*
- B. Anatole Falagan, *Long Beach Water Department*

basis--or at least until the Delta supply was up and running again--the time and cost to implement, and the advantages and disadvantages of each option-environmentally, from an energy perspective, and socio-politically. They were also asked to identify the factors most important and uncertain in evaluating the potential of the option they were exploring.

Increased Conservation was clearly the first choice of participants among the options to exercise first. It is the cheapest strategy with the shortest time to implement, and the least energy intensive. Because southern California already does a good job of water conservation in urban areas, the next gains may be harder to achieve and sustain, but there is still significant potential for savings. Outdoor landscaping may have the greatest potential for substantial conservation in the urban sector. While increased conservation can reduce demand quickly, it also can put a financial burden on water agencies that rely on revenue projections associated with water deliveries. Agencies should consider maintaining sufficient reserves to withstand a two-year reduction in planned water sales. Agricultural uses should be examined to assess what savings in water use could be achieved and sustained without adversely affecting agriculture's contribution to the State's economy. Changes in irrigation technology and crop selection have the greatest potential for reducing agricultural water use.

Increased Storage and Groundwater Pumping has significant potential for expansion if a number of the obstacles can be overcome. Groundwater storage and pumping were used extensively during the last drought (1990-1992) when Delta supplies to southern California were reduced by over 50% and MWD is implementing a variety of groundwater storage projects throughout southern California. There are more than 600,000 acre-feet of unused groundwater storage space available in southern California. The primary impediments to expanding this option are governance and water rights issues. Groundwater can be seen as a property of the landowner, but the groundwater system is interconnected and what is removed by one user affects what is available for others. The governance needs to be clarified and simplified. There also are water quality issues that arise from moving groundwater around, some of which is contaminated, resulting in questions of liability. If groundwater storage is to play a role in the event of the loss of the Delta contribution, it needs to be exercised in advance when water is plentiful. It will be too late to implement after the levees fail.

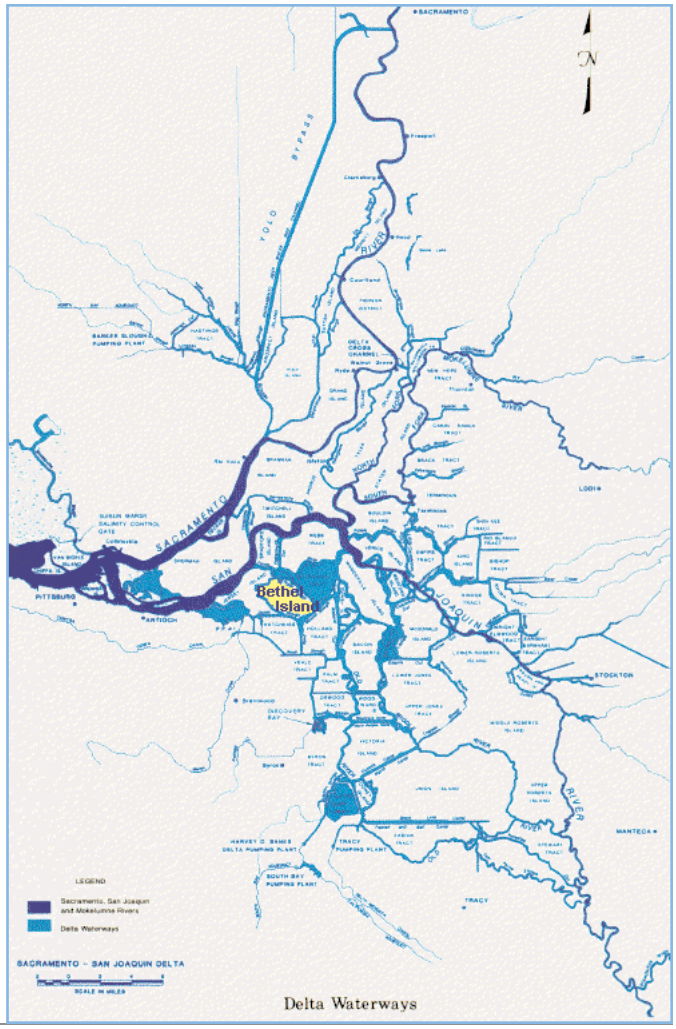
Reuse and Reclamation of Agricultural Water is a potential source of water, particularly for reuse as agricultural water. Farmers in the Irvine Ranch Water District have used recycled water for irrigating crops since the mid-1960s, and the use is fully regulated and permitted by California's Department of Health Services. The use of recycled agricultural water for potable water carries with it concerns about quality and safety. Technologies exist to build treatment plants to reclaim and treat agricultural water for use as potable water, but the public's perceptions may remain. These facilities would have to be installed at appropriate locations and they carry a cost that is a function of the level of treatment desired. This might be the time limiting step in implementing the option.

Reuse and Reclamation of Wastewater is clearly a viable option. Southern California's POTWs--Publicly Owned Treatment Works--discharge more than 1 billion gallons of wastewater into the ocean each day. Over the course of a year this is more than 1.2 million acre-feet of fresh water discharged to the ocean. The technology exists to reclaim and treat this water to drinking water standards. The Governor's Water Recycling Task Force report in 2003 makes specific recommendations to increase the use of recycled water throughout California. However, broad public education programs are needed regarding the safe practices and history of recycling in California (e.g. Irvine Ranch Water District's dual irrigation system since the 1960s and the recharge of the San Gabriel River with recycled water since 1963 are examples of programs that have occurred without any water quality or public health related issues). Irvine Ranch Water District has been reclaiming and reusing municipal wastewater since 1967 when they completed their reclamation and treatment facility. All reclaimed water is tertiary-treated. The primary use of this water is for landscape irrigation. Other uses include agriculture, toilet flushing and cooling towers in commercial buildings, and industrial uses. But, the public perception of "toilet to tap" remains. Other obstacles are time to implement, funding, federal and state grant incentives, and regulatory impediments. Such a strategy has clear marine environmental benefits. Recycled water use saves significant amounts of energy when compared to importing water from the Delta.

Capture and Reuse of Urban Runoff has the potential to contribute on a sustainable basis to southern California's water portfolio because approximately 500,000 acre-feet could be captured on an annual basis. Because so much of southern California's landscape has been hardened with impervious surfaces, the percentage of water that falls on Southern California as precipitation that runs off to the ocean is high. Exercising this option would require planning, collaboration among stakeholders to develop the appropriate infrastructure to capture the water, and incentives for cities to spread the idea. The water would need to be treated for beneficial reuse. A dramatic reduction in urban runoff would reduce contaminant loadings to coastal waters, but could have impacts on coastal ecosystems that require evaluation.

Increased Deliveries from the Colorado River has some potential to provide benefits during emergencies, but would not be sustainable for long-term water supply. The Colorado is the only federally-run river in the United States, and California operates under an allocation of 4.4 million acre-feet/year. Currently, Metropolitan's Colorado River Aqueduct, which supplies water to the Southern California region, delivers about 700 thousand acre-feet/year, but has the carrying capacity to deliver 1.25 million acre-feet/year. The consensus was that if California could demonstrate that it had made every reasonable effort to exercise all other options using California water, that there might be a temporary increase in the allocation from the Colorado River that could potentially fill the Aqueduct during an emergency. In addition, new transfers away from agriculture could be implemented within California through land-fallowing programs. However, taking any water out of the Imperial Valley for urban use would have environmental effects on the Salton Sea and its surrounding areas that would need to be addressed. And, we should not lose sight of the fact that diversion of water away from the Colorado has had serious environmental effects on the ecology of the upper reaches of the Sea of Cortez; effects that can not be mitigated.

Ocean Desalination was clearly the most controversial and contentious of the options explored. No other option evoked a comparable emotional response. It is clear that ocean desalination is the most energy intensive of all the options, although energy requirements are decreasing with evolving reverse osmosis (RO) membrane technology. All options, except perhaps conservation, have energy requirements and 19% of all of California's present energy use is associated with pumping to move water around the state. The lead time to build and operate a new plant is 4-5 years. The present regulatory environment is a morass that requires more than 17 permits from different agencies, and is clearly an impediment to exercising this option. The potential supply from ocean desalination is virtually unlimited. The largest environmental impact of ocean desalination would be additions to the carbon footprint. Other potential environmental impacts of entrainment and discharge can be virtually eliminated through proper siting and engineering design. The Long Beach Water Department's approach to evaluating the potential of ocean desalination is one that can serve as a model for other com-



munities. It was designed from the outset as a research and development program that has moved systematically from research to prototyping to a small scale demonstration project now under construction.

Policy Response Panel

FOLLOWING THE REPORTS on the various options, a panel of policy analysts and policy-makers gave their responses and recommendations. The Panel participants consisted of Keith Coolidge, Ronald Gastelum (attorney and Director, Aquarium of the Pacific), Stephen Flynn, and Randall Crane (professor, UCLA). The challenge for the panel was to react to everything they heard and recommend policies southern California could adopt to diversity its water portfolio and make it more resilient.

There was a strong feeling that crises present opportunities and that southern California should begin now to implement plans in the event of a failure of Delta levees. The four main issues they identified were implementation, funding, political will, and public perception. Hurricane Katrina provided California and the rest of the nation with valuable lessons on the need not only to develop disaster response plans, but also to ensure that institutional mechanisms and disaster response teams are ready to execute those plans.

The U.S. Army Corps of Engineers certified that the levees in the Sacramento-San Joaquin Delta are more vulnerable to failure than those in New Orleans were before Katrina. New Orleans had disaster response plans, but there was a breakdown in institutional mechanisms to execute those plans. In southern California we do not even have the plans let alone the institutional mechanisms to execute those plans.

A Closing Statement

IT IS CLEAR THAT SOUTHERN CALIFORNIA has been betting its future on an unstable water system. Efforts to find a long-term solution to problems facing the Delta are laudable, but getting through the quagmire of conflicting interests will take time, time that may not be available for southern California. Moreover, near-term fixes to fortify the levees will not provide protection against a major earthquake. The challenge for southern California is to develop a portfolio of water options that provides the flexibility and security needed to meet current and future demands under a range of probable scenarios that include losing the supply from the Delta for a period of one to two years, or longer. It is clear that we need to expand and diversify the present portfolio of water options for southern California.

The Aquarium of the Pacific's Aquatic Forum is dedicated to exploring important, complex, and often contentious issues with environmental, social, and economic dimensions. The Aquatic Forum is an activity of the Marine Conservation Research Institute (MCRI).

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