Water Management Approach

California has many difficult water management issues. The CALFED Bay-Delta Program is not attempting to solve all of these issues. Our primary water management concern is the Bay-Delta system, and in particular the water management issues that directly affect the Delta. The Delta is the heart of California's water distribution system. Demand is placed on water for use upstream of the Delta and in the Delta for ecosystem, urban and agricultural purposes, as well as for water exported out of the Delta for the same purposes. This demand exceeds the reliable supply of water flowing into the Delta, particularly during dry periods. As the population of California continues to grow, this mismatch will get worse if nothing is done. The Program intends to reduce the mismatch between supply and demand over time by reducing the demand and by increasing the reliable supply, again particularly during dry periods. Moving water from wetter periods to dry periods, and the contention that this can be done without harm, is the cornerstone of the Program's approach.

The Delta can be viewed as a hub, with water flowing in from several sources. Most of the water flowing into the Delta continues on out to the Pacific Ocean. Some is diverted for use in the Delta, and some is exported for use elsewhere. All of the water flowing into the Delta serves a purpose as it flows through, providing water habitat, nourishing other types of habitat, as well as maintaining water levels and quality for human uses. On the whole, the Program cannot truly increase the amount of water which flows from the watershed to the Delta. The total amount depends on rain and snowfall. What the Program can do is to affect, when water reaches the Delta hub, arranging it so that more water reaches this hub during dry periods to the benefit of both the ecosystem and human uses, reduce the demand from human uses during average and dry periods, and by storing water during periods when flood flows exist in the system.

This paper looks at each Program component (described below) in terms of how it affects this Delta hub. Remember that comparisons need to be made not only relative to current conditions, but also to conditions over the next several decades if nothing were to be done (as in the No-Action Alternative). Also, remember that the emphasis is on dry periods as that is when the mismatch is most critical. Over time, Program components can:

- Reduce demand on the Delta hub by decreasing total water use dependent on the Delta (for example, installing low-flow toilets and other conservation measures)
- Reduce demand on the Delta hub by increasing dry period supplies of water from sources that do not go through the Delta hub (for example, conjunctive use south of the Delta)
- Reduce demand on the Delta hub from within the Delta by restoring the ecosystem so that it can remain healthy using the amount of water flowing through the Delta hub (for example, restoring Delta habitat)
- Increase the reliability of a predictable amount of water flowing into the Delta hub (for example, new storage upstream of the Delta)
- Increase the amount of water flowing into the Delta hub during dry periods (for example, water transfers from upstream of the Delta)

- Increase the efficiency of the operation of the Delta as a hub so that you can get the same results using less water (for example, improving conveyance through the Delta)

A successful Program will be one that reduces the mismatch between supply and demand during dry periods without hurting the ecosystem by diverting too much during average or wet periods.

Each Program component contributes to solving the problem, as explained in the rest of this paper, but no single component can do it alone. The combined effect of all them working in unison is what can make it work.

Water Use Efficiency

The Water Use Efficiency component of the CALFED Program has been the subject of many meetings and discussions. In part, this is because it means different things to different people. For some people efficiency means using no more water than necessary to do the job. For others, efficiency means using water for the highest value uses, as determined by the price that people are willing to pay for the water. In the first case, water use is only inefficient if more is used than is required for that particular purpose. In the second case, water use is inefficient if someone else would pay more to use the water for a different use. This creates a basic conflict, as efficient usage under the first definition can be seen as inefficient under the second definition.

The Water Use Efficiency component of the CALFED Bay-Delta Program is based on the first definition. It seeks to limit the use of water to the minimum needed for each use, but does not seek to change the type of use based on the economic value of that use. This component relies on effective implementation of existing laws and agreements to increase efficiency for urban, agricultural and environmental refuge uses.

This component can reduce demand on the Delta hub by a) reducing total water usage in communities dependent on the Delta hub through such things as low flow showerheads and toilets, greater use of optimal irrigation systems in urban landscapes and agricultural operations, and b) increase available supply of water not dependent on the Delta hub through more water recycling.

The Program estimates that in an average year this component could (refer to Table 1):

- Reduce urban demand by up to 750,000 acre-feet above the level estimated for the Urban Memorandum of Understanding (i.e., levels of efficiency expected regardless of Program actions).
- Reduce agricultural demand by 125,000 to 200,000 acre-feet beyond what current trends have and continue to result in.
- Increase water recycling as an alternative supply by up to 1 million acre-feet

An important consequence of this increased efficiency is that the remaining levels of demand on the Delta hub are much less flexible. Users will have already cut back their water use in their least important uses, and in dry periods they will not have as much room to cut back further. This "demand hardening" means that reliability becomes even more important, because any shortages on top of conservation cause greater hardship. It is also important to understand that when these savings occur in export regions, they will generally be used locally to help offset growing demands or to meet current unmet needs. In such instances, they are unlikely to result in more water available in the Delta.

Watershed Management

The Watershed Management component consists of ecosystem restoration and water quality actions in the lower watershed and partnership projects with local entities in the upper watershed to improve water quality and increase base flows in the tributaries to the Delta hub.

This component can increase the reliability of predictable amounts of water flowing into the Delta during the dry portions of the year by slowing down the rate at which water leaves the upper watershed. This increases the flow of water later in the year. The effect of this component has not been quantified, but there is potential for improved water quality and increased reliability through better managing the watershed.

Water Transfers

The CALFED Bay-Delta Program Water Transfer approach is to facilitate activities that will promote water transfers.

For transfers to work, they have to take into consideration the possible effects of the transfer on the communities within which the water is being sold. When they work as planned, transfers can have the effect of both reducing demand on the Delta hub and of increasing supply to the Delta hub. Transferring water from upstream of the Delta through the hub during dry periods increases the supply, as well as creating benefits instream while it is flowing through the Delta. Transferring water "downstream" of the Delta, for example from one exporter to another, can have the effect of reducing demand on the hub by increasing the availability of alternatives to Delta water during dry periods.

The Program estimates that water transfer capacity will range from 400,000 to 1.1 million acre-feet in dry years, depending on which Phase II alternative is selected. This capacity is compatible with potential demand for transfers, but should not be confused with it. Though capacity for more transfers is a likely part of the solution, along with improved processes for transfers, there is no guarantee that all additional capacity will be used. Ultimately, water transfers come down to the willingness of buyers and sellers to participate. In dry periods this willingness is estimated to potentially result in 1 million acre-feet per year of transfers.

Storage Facilities

The Program is looking at several different types of storage facilities:

- Upstream of Delta surface storage
- Upstream of Delta groundwater banking/conjunctive use
- In-Delta surface storage

- Off-aqueduct surface storage
- "Downstream" of Delta groundwater banking/conjunctive use

Storage upstream or in the Delta has the potential to increase the amount of water flowing into the Delta during dry periods, and to increase the reliability of a predictable amount of water flowing into the Delta. This works because new storage lets more water be held upstream of the Delta in times of high flows. During dry periods, this water can be released to increase the flow for many purposes. Ideally, these releases can be planned to produce instream benefits for the ecosystem and water quality, as well as diversion benefits, from the same release of water.

It is important to make sure that the water held back in wet periods is done in a way that does not create harm. The Program's approach is to hold back water only during high flows, and only after the peak of the high flow has passed, to avoid losing the natural effects of high peak flows on the Delta system.

Storage "downstream" of the Delta has the potential to reduce demand on the Delta hub during dry periods by increasing the supply of water from alternative sources. Water can be put into this storage out of the Delta hub during less critical periods, so that when water from the Delta hub is not available, users can turn to this stored water as an alternative.

Estimates of the poltential water supply benefits of new storage are dependent on several factors, including location, alternative configuration, and operating assumptions (both for the storage facility itself and for movement of stored water throughout the Bay-Delta system). Modeling results using storage capacity of nearly 5 million acre-feet show the potential for up to 950,000 acre-feet of additional supply for Alternative 3 during critically dry periods. Alternative 1 has less potential during critical periods. Also, long-term water supply potential is significantly less than that shown to possibly occur during dry periods.

Conveyance Improvements

The Phase II alternatives provide three choices for conveyance through the Delta hub. All three decrease the detrimental effects on the ecosystem and Delta water users of using the Delta hub for water conveyance, while improving the effectiveness of the Delta as a conveyance hub.

Conveyance improvements can enable drinking water to be moved through the Delta hub with less risk of contamination by seawater or naturally occurring organic material found in the Delta by reducing contact with seawater or water in the Delta. The improvements can also reduce the detrimental effects on fish of moving water through the Delta by reducing unnatural flow patterns, screening diversions, and providing alternative diversion points. The improvements can also enable more water to be moved through the Delta during times when it does the least harm, which enables less water to be moved through the Delta in times when it would be more harmful.

Similar to storage, additional water supply potential from conveyance facilities is dependent on the alternative configuration, operating assumptions for movement of water in the Bay-Delta System, and size of conveyance improvement. Because the operating assumptions for any new conveyance improvement is uncertain, modeling results have shown a range of water supply potential from as much as 250,000 acre-feet of additional supply in critical periods to an impact of -250,000 acre-feet during the same period but under different operating assumptions.

Ecosystem Restoration Program Plan

The Ecosystem Restoration Program Plan includes many actions that will make the Delta system hardier and healthier. Over time, this can result in the Delta ecosystem being more resilient and less subject to damage from the effects of water diversions for human uses.

From the perspective of the Delta hub, this means that it may be possible to move more water at some times, and less water at other times, in a manner which causes the least harm for the ecosystem. This additional flexibility can result in a more reliable flow of a predictable amount of water from the Delta hub, as well as the potential for greater supply by, again, reducing the amount of water needed as a cushion while moving water through the Delta hub.

Levee System Improvements

Levee system improvements reduce the risk that levees will fail during flood periods. This can protect not only lives and property of those who would otherwise have been flooded, but can also protect wildlife habitat from inundation and the diversion pumps for the State Water Project and the Central Valley Project from being shut down due to seawater contamination. Protecting the pumps increases the reliability of predictable amount of supply being available from the Delta hub by reducing the risk of a catastrophic failure of levees in the Delta that could force the pumps to shut down for an extended period. The water supply impact of this kind of shutdown could be disastrous.

Putting It All Together

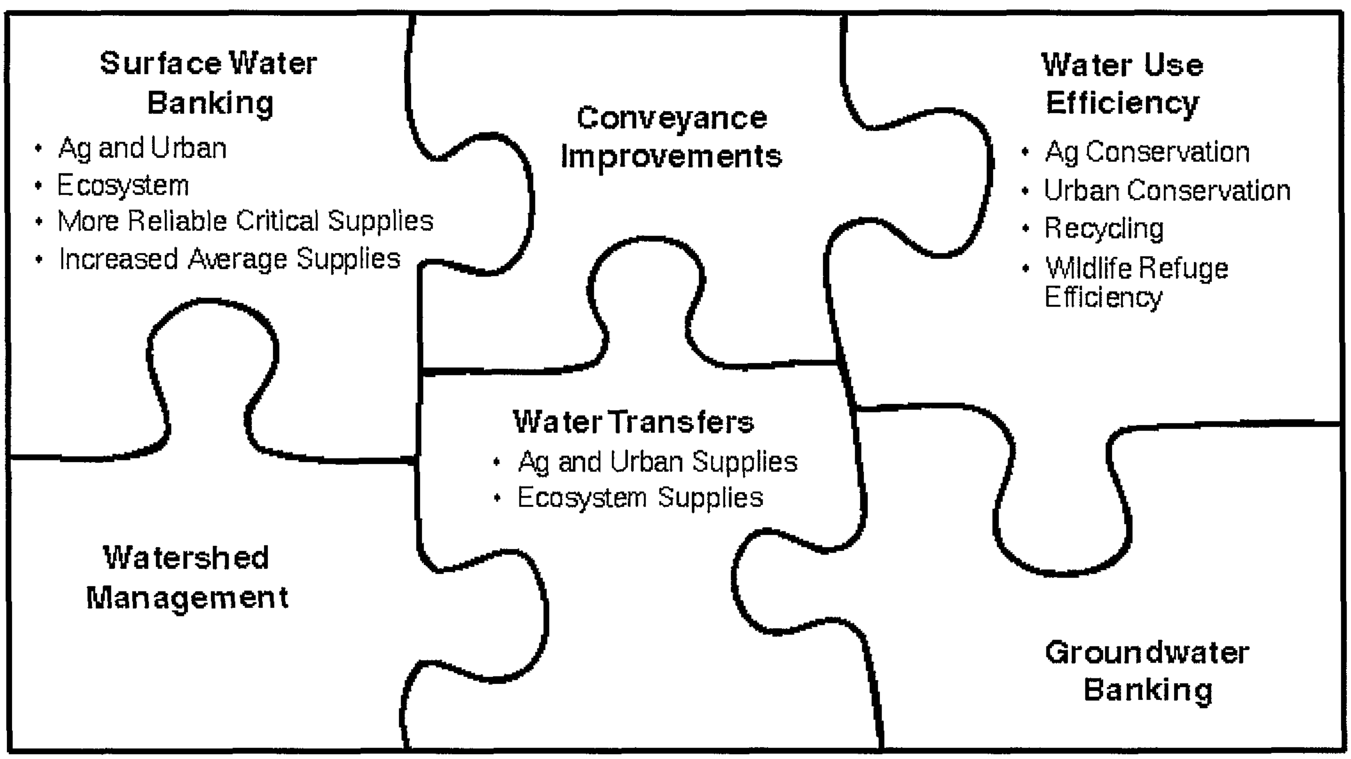
The components discussed above are dependent on each other. Some components do not work well unless they are paired with other components. For example:

- Conservation needs to be matched by greater reliability; otherwise "demand hardening" could result in higher economic damage from shortages.
- Conservation can work with transfers by freeing up water to transfer that was previously being used for other purposes, (though in export areas, such as Southern California, the "transfer" could be internal to meet increasing population demands).
- Storage "downstream" of the Delta hub, whether surface or groundwater/conjunctive use, doesn't work to reduce dry period demand on the Delta hub unless you can fill or refill it with greater diversions during wet periods. This means that conveyance improvements are desirable to allow more water to be diverted during less critical periods.

- Conversely, conveyance improvements are not as effective unless there is a place to put the additional water. This means that new storage "downstream" of the Delta hub may need to be paired with conveyance improvements.
- Transfers from upstream of the Delta do not work as well unless you can assure future water supply for local areas, such as with new storage upstream of the Delta.
- Transfers from upstream of the Delta cannot happen unless there is sufficient capacity in the conveyance system to let the water move through the Delta in a manner which results in the least harm for the ecosystem, and without a large unrecoverable cushion to protect the ecosystem and water quality from the effects of the transfer.

As the diagram below highlights, solving the water management puzzle involves all of the Program components. But there is still more to the picture. The fundamental driving force that will make this comprehensive approach work is the price of obtaining water. The price of obtaining water determines whether storage is economically justified, whether water users decide to sell their water, which water efficiency measures are cost effective, as well as the level of demand for water from the Delta system.

Water Management Strategy



While it is not the intent of the Program to manipulate the price of water, paying for these Program components will unavoidably affect the cost of obtaining water from the Delta. At current price levels, demand exceeds supply. The cost of obtaining water either through the existing system or from new facilities could increase as a result of the Program. For the existing system (including upstream appropriative and riparian uses), the cost could rise due to inclusion of the costs of some additional environmental, water quality, and levee reliability programs into the cost of obtaining water from those sources. New facilities are more expensive to begin with, and they may also include new environmental costs. These increased prices for obtaining water from the Delta hub should work to reduce demand for water from the Delta over time. If water is more expensive, people will be more careful how they use it, and cut back where they can.

A higher cost for Delta water has other effects. The increased cost makes water efficiency actions more cost effective, and at the margin may make some actions economic that were previously uneconomic. It can also have the effect of raising the price at which water could be transferred, which increases the economic incentive to transfer. Again, at the margin this could result in some transfers that would otherwise not occur.

The economic justification for additional storage is based on the marginal willingness of users to pay for the additional water supply benefits created by the storage. Some water users may to be willing to pay more than current prices to obtain more water. From an economic perspective, additional storage is justified as long as the marginal cost of the storage is less than the marginal willingness of users to pay. This level is related to the cost of alternatives to Delta water, including forgoing water use.

The combination of these economic effects serves to decrease the mismatch between supply and demand for water from the Delta system. There is incentive to reduce demand due to higher costs of obtaining water. The demand reduction would come in the form of increased conservation and recycling, greater incentive to use alternative supplies including transfers external to the Delta system, as well as forgoing some water use. Supplementing these supplies are water supply opportunities provided by new facilities, as well as incentives to transfer water upstream from the Delta.

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