

Recommended Next Steps for Improving Quantitative Information for the California Water Plan

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Abstract

This proposal identifies three broad activities that must be initiated and conducted simultaneously to improve the analytical capabilities of the California Water Plan. These are:

- Promoting Collaboration
- Facilitating Information Exchange
- Improving Numbers for the California Water Plan

California needs significant improvements in its analytical tools and data to effectively evaluate the costs, benefits, and tradeoffs of alternative water management strategies. These improvements must be done in a way that promotes regional integrated resource planning. Recent water bonds, the California Water Plan, and CALFED Bay-Delta Program have all highlighted the need for greater emphasis on regional decision making in water planning.

There is a tremendous amount of work to be done to provide the desired quantitative deliverables for future Water Plan Updates. This work needs to be done during a time of limited budgets and considerable uncertainty with institutional responsibilities related to the CALFED Program. Recent events have placed much more attention on this matter than is typical within the public policy arena. We have an opportunity to take advantage of this increased attention and bring people together and encourage creativity about how the information that people are asking for can be provided with transparency.

It is important for DWR to build momentum in the quantitative activities described in this proposal. And it is important that key policy advocates are aware of the need to improve statewide water planning and how they can help to set realistic goals as we proceed.

Background

Several factors have caused DWR to rethink how it evaluates California's future water conditions. First, there is a need to provide policy-makers and the public with more detailed quantitative information about the costs, benefits, and tradeoffs associated with different water management strategies. Second, data, analytical tool development, and data management have not kept pace with growing public awareness of the complex interactions among water-related resources. Additionally, California lacks a consistent framework and standards for collecting, managing, and providing access to data and information on water and environmental resources essential for integrated resource planning. More accurate data and analytical tools and better information management can reduce many uncertainties about the State's current and future water resources: how water supplies, demands, and quality change in response to different resource management strategies; how ecosystem health and restoration can succeed; and how we can adapt our water system to reduce controversy and conflicts.

Organizing a Response

DWR, through the California Water Plan, proposes to take the lead in organizing a response to the limitations described above. With assistance from Dr. Kenneth Kirby of Active Curiosity, Inc., DWR has identified three broad activities that must be initiated and conducted simultaneously to improve analytical capabilities in support of the Water Plan. The context and next steps for implementing the three activities described below are the focus of this proposal. Implementing a response requires significant participation by many entities who either generate information used by the Water Plan or use information in the Water Plan to make decisions. The critical activities are:

- Promoting Collaboration
- Facilitating Information Exchange
- Improving Numbers for the California Water Plan

Promoting Collaboration

There are many reasons to promote collaboration. Integrated resource planning requires multi-disciplinary information, and no single entity has the expertise or other resources required to develop all of the analytical tools and data needed to answer these broad questions. Furthermore, people want to improve the shared understanding and access to useful information across the state at an appropriate resolution. This desire to report information at various resolutions around the state requires that local and regional entities be able to interact and share data in some commensurate way. Promoting collaboration includes improving the institutional setting for quantitative work and partnering on near-term studies.

Improving the Institutional Setting for Quantitative Work

Perhaps one of the most critical activities for the near future will be to engage interested parties throughout the state to establish a new institutional network to leverage available resources and improve the shared quantitative capability involving California's water management system. As discussed in the background section of this document, existing analytical tools are not sufficient to meet all of today's needs for quantitative information. Effectively meeting these needs will require considerable networking, collaboration, and information sharing between federal, state,

local, and regional entities. The September 2005 report prepared by the California Water and Environmental Modeling Forum (CWEMF) entitled, “*Strategic Analysis Framework for Managing Water in California*”, presents a wide array of possible institutional arrangements that could improve the institutional setting for developing and applying qualitative capability over the long-term.

Next Steps for DWR:

- DWR will take the lead to form a broader institutional network dedicated to the development and proper application of quantitative capability for water management needs throughout California. DWR will invite and encourage others to join this network.
- DWR will seek advice from the Water Plan Analytical Tools and Data Workgroup about how best to implement the work described in this paper and how best to interface with activities conducted by CWEMF.

Partnering on Near-Term Studies

For preparing *California Water Plan Update 2005*, DWR established some mutually beneficial partnerships with entities engaged in research or studies of interest to the Water Plan. DWR will continue to form these partnerships for the next Water Plan Update as a way of infusing new ideas and to maximize the benefit of outside expertise and funding. At this early stage, DWR has engaged in two promising partnerships:

- 1) DWR is working with the Rand Corporation to evaluate uncertainty in water management using the technique of Robust Decision Making.
- 2) DWR is working with the Natural Heritage Institute, the National Center for Atmospheric Research, and the Tellus Institute, to evaluate the effects of climate change on water management in California using the Water Evaluation and Planning System model, WEAP.

Next Steps for DWR:

- In collaboration with others, DWR submitted several proposals through the 2004 CALFED Science Proposal Solicitation Program that could serve as additional areas of investigation. Although these projects were not recommended for funding they can form the basis for future research. These proposals would develop decision support tools, improve linkages between existing models, improve the Integrated Groundwater Surface Water Model (IGSM2), and provide better estimates of evapotranspiration from agricultural lands and managed wetlands.
- DWR will work with the Analytical Tools and Data Workgroup to identify areas of key research interest for the next Water Plan update. DWR will seek out entities engaged in these key research areas and invite them to collaborate on mutually beneficial projects. DWR will pursue those projects where each side is willing and able to dedicate the required resources to implement the project.
- DWR’s Water Plan and CALSIM III development staff are working to improve communication between DWR’s data collection activities and its analytical capabilities.

- DWR is exploring the possibility of contracting with the University of California, Davis to apply the CALVIN model to develop and evaluate response packages to the scenarios described Water Plan Update 2005.

Facilitating Information Exchange

In the *California Water Plan Update 2005*, DWR committed to begin implementing "... the Water Plan Information Exchange (Water PIE) for collecting and sharing data, and networking existing databases and websites, using GIS software to improve analytical capabilities and developing timely surveys of statewide land use, water use, and estimates of future implementation of resource management strategies". Implementing Water PIE requires both short-term and long-term phases. The short-term phase will likely include showing linkages and providing easy access to information used by the CALFED Bay-Delta Program Common Assumptions and California Water Plan to assess current and future water management conditions. This will help to promote transparency and build confidence among stakeholders that related statewide planning efforts are being sufficiently coordinated. The goal of the long-term phase is to develop an interactive data management system to promote integrated regional water planning. Water PIE will require protocols for managing data including a common definition of terms and data quality control. Promising next steps for Information Exchange follow.

Next Steps for DWR:

- DWR will work with the Water Plan Analytical Tools and Data Workgroup to develop a strategy to exchange information. Key tasks for information exchange include developing a common glossary of terms, water budget components, and guidelines for data collection, compilation, and management.
- DWR will meet with other agencies responsible for implementing data sharing programs to learn about the approaches used and challenges faced. Examples include MWD's Integrated Water Resource Plan, The Santa Ana Integrated Watershed Plan, the California Environmental Data Exchange Network, and the California Data Exchange Center.
- DWR will develop a web portal to link to or publish data used by the California Water Plan and the CALFED Bay-Delta Program Common Assumptions group. The initial focus will be on agriculture water use efficiency, urban water use efficiency, conjunctive management, water recycling, desalination, and water transfers. Information sources may include:
 - State water bond grant proposals
 - Agricultural Water Management Plans
 - 2005 update of Urban Water Management Plans
 - DWR's California Land and Water Use database and web portal
 - California Water Plan Water Portfolios
 - Later efforts may include information from City and County General Plans.

Improving Numbers for the California Water Plan

The CWP Update 2005 outlines three sets of quantitative deliverables:

- Water Portfolios
- Future Scenarios
- Alternative Response Packages

The information provided from these quantitative deliverables will be in the form of reporting metrics. Reporting metrics are quantitative numbers that represent something measurable. These numbers are reported prior to a judgment of the adequacy or desirability of the numbers with respect to specific objectives.

With regards to providing these quantitative deliverables in future Water Plan updates, the following activities were contained in the Update 2005 action plan:

- Develop a general checklist of issues, resources, data, and analytical tools as well as guidelines to aid regional integrated resource planning.
- Select and/or develop analytical tools and data in support of the next California Water Plan Update.
- Participate in efforts by the CWEMF to develop and carry out a plan for long-term improvement of analytical tools and data for statewide water planning.

A significant barrier to reaching agreement about specific computational methods is an insufficiently developed *shared understanding* of how the California water management system works, and how it responds to changes. When there is a technical disagreement about a model or parts of a model, we rarely have a productive discussion that leads resolution. Discussions tend to be vague. The only approach effectively applied to resolve technical disputes has been to pay experts to conduct a scientific review. This is both expensive and slow. It would be much better to have a process for simultaneously improving the conceptual understanding of California's water management system and its representation in the analytical tools we use. To achieve this end the CWP team has committed to:

- Take a fresh look at our collective understanding of how the water management system works
- Interact with experts to make sure we capture the latest thinking
- Document our collective understanding of the water management system in an archival manner that can evolve over time

These ideas were presented and discussed in a meeting with the Analytical Tools and Data Workgroup on June 3, 2005. The major concepts are outlined in a PowerPoint presentation used during that meeting (see <http://www.waterplan.water.ca.gov/tools/index.cfm>). During the meeting, DWR proposed to apply a standard analysis and design approach used widely in the software development industry, called the Unified Process. The Unified Process is an iterative approach based on object-oriented thinking that allows a team to identify and describe the relevant aspects of the real world that should be represented in an analytical tool to fulfill a particular purpose. Through the Unified Process, a number of artifacts can be developed collaboratively to document the requirements of the quantitative analysis system, and a shared understanding of the water management system. The artifacts can be developed using the Unified Modeling Language (UML), which is a visual notation language that provides a standard

notation to describe a system in terms of objects, relationships, interactions, sequence diagrams, and state changes. We propose to proceed with this or a similar method by focusing on one reporting metric at a time (e.g., urban water demand) so that the discussions can be specific.

Next Steps for DWR:

- DWR will raise awareness and provide training for DWR staff and interested stakeholders in the areas of object-oriented thinking, the Rational Unified Process, and the Unified Modeling Language. An initial 1-day work shop will be held for program managers to provide an overview of these ideas. CWP will work with our stakeholders on how to use UML or other identified approaches for documenting the important factors and interrelationships that describe the water management system.
- DWR will work with the Analytical Tools and Data Workgroup to create a “high-level” conceptual design that describes urban water demand. This conceptual design will identify the components of the water management system necessary to compute urban water demand under various conditions. Examples of these components include demand forecasting, supply forecasting, and technology adoption. These component descriptions will be created and refined over time.