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CALFED Surface Storage in California

The CALFED Record of Decision (2000) identified five potential surface storage reservoirs that are being investigated by the California Department of Water Resources, U.S. Bureau of Reclamation, and local water interests.

- Shasta Lake Water Resources Investigation (SLWRI)
- North-of-the-Delta Offstream Storage (NODOS)
- In-Delta Storage Project (IDSP)
- Los Vaqueros Reservoir Expansion (LVE)
- Upper San Joaquin River Basin Storage Investigation (USJRBSI)

PLACEHOLDER Box #-1 Abbreviations and Acronyms Used in This Chapter

Water resources planning has changed significantly over the past several decades. New approaches to planning for CALFED surface storage has resulted in a new era of project formulations designed to address a new era of water resources needs. The State and federal governments have funded the five surface storage investigations, which were explicitly conceived to support at least three of CALFED’s program goals: water supply reliability, water quality, and ecosystem restoration. From the outset, investigation planners acknowledged that the traditional dam building model of the past would not be helpful in solving California’s water challenges. In fact, these approaches would likely exacerbate many of the State’s water resources problems, including perceptions about winning and losing in California’s water battles. CALFED considered new onstream storage untenable. Offstream storage or expansion of existing storage proposals were considered, but formulations would emphasize effective mitigation of impacts. In addition, these new proposals would not limit consideration of environmental effects to mitigation, but would instead be designed to improve environmental conditions. Project purposes emphasize multi-objective storage, combining newer objectives associated with ecosystem restoration and water quality with more traditional purposes of water supply reliability, hydro-power and flood control. These new projects would support aquatic and riparian ecosystem restoration focused on the Delta and its tributaries, improved drinking and habitat water quality, and the water supply needs associated with California’s growing population and diverse economy.

The CALFED surface storage project formulations have dedicated significant project resources to broad public benefits including ecosystem restoration, habitat water quality, and water supply reliability for environmental uses (see Table #-x CALFED Surface Storage Initial Alternatives...
Benefits Summary) that would be paid for by the State and/or Federal governments. Contributions to a reliable water supply for California are also explicitly included. Urban and agricultural water supply reliability and drinking water quality are generally considered non-public benefits that would be paid for by water retailers and users.

The continuing CALFED Surface Storage Investigations are in their final phase of planning. Funding for In-Delta Storage ended in Fiscal Year 2005. The remaining investigations are continuing. State funding for State agencies to participate in the Shasta Lake investigation also ended in Fiscal Year 2005. State Feasibility Reports will be completed in 2008 and 2009 for LVE, NODOS, and USJRBSI. Draft Federal Feasibility as well as Draft State and Federal environmental reports will be released in 2008 and 2009 for the four continuing investigations. Final reports will be completed in 2010. DWR and Reclamation plan significant outreach and stakeholder input throughout this final phase and especially during the comment period of the environmental documents.

Potential Benefits of CALFED Surface Storage

The size and location of these surface storage projects facilitates the accomplishment of benefits in two distinct ways. First, many benefits are achieved directly by releases from a new reservoir. Second, additional storage can provide significant system flexibility such that other facilities’ operations can be modified (without reducing current benefits) to support additional benefits within the system. Additional water in storage can be used to either improve ecosystem functions and conditions for targeted species, or improve water quality or supply reliability for water users. Another important characteristic of these proposals is the geographic location of the benefits. A number of the environmental benefits occur within the Sacramento-San Joaquin Delta. Other environmental benefits are targeted at the Delta’s tributaries including the Sacramento and San Joaquin rivers and the Yolo Bypass, recognizing the direct connections between tributary and estuarine health. Water supply reliability improvements are generally for State Water Project and Central Valley Project contractors or environmental uses.

Performance of the CALFED surface storage projects is measured using an operations simulation of the Central Valley Project and State Water Project systems, using the historic hydrologic sequence 1922 - 2003. CALSIM II provides detailed information related to operations of the system under with and without project conditions. Results are often reported with both average annual values and driest periods (1928-34, 1976-77, and 1987-92) average annual values, reflecting the importance of performance under drought conditions. This type of comprehensive analysis allows investigators to determine how much water from a proposed project will be used to meet needs that would not be met without the project. In addition, DWR and Reclamation have developed a suite of analytical tools that are used in a coordinated manner with the operations simulation to assess other important characteristics including Delta water quality; Sacramento River temperature, water quality, fishery effects, river meander, sediment transport, riparian success; and water resources economics. DWR, Reclamation, and other agencies have developed a Common Assumptions process that establishes a common set of tools, operations, planning assumptions, and reporting metrics so that projects are evaluated with a common foundation.
Box #1 Analysis of CALFED Surface Storage Benefits

Reported benefits of CALFED Surface Storage projects shown here should not be interpreted as similar to benefits reported by other strategies. Since the CALFED Surface Storage strategy uses an operations simulation, only benefits that would otherwise go unmet are accounted. In addition, an economic analysis determines whether benefits could be achieved at a lesser cost by other strategies. The comprehensive nature of these analyses allow the investigations to more accurately describe benefits that are both operationally feasible, within limitations of the water resources system, and economically feasible. Other strategies that do not use operations simulations or economics report a benefit capacity. The benefit capacity of the CALFED surface storage projects is significantly greater than the benefits described here. Using a benefit capacity analysis, the quantity of water developed or saved may or may not be needed at the time and location the capacity is available. If there is a need, the capacity approach does not determine if the benefit can be feasibly accomplished, based upon the operational limitations of the State’s water resources system and economic considerations. While these benefit capacity estimates may or may not improve water supply reliability, other benefits not related to water supply reliability may be valuable.

More detail associated with specific benefits is shown in Table #1 CALFED Surface Storage Initial Alternatives Benefits Summary and is derived from each investigation’s plan formulation documents. One initial alternative from each on-going investigation’s planning documents is described here and summarized in Table #1. These initial alternatives are not feasibility or environmental documentation alternatives and are not preferred. However, the initial alternatives described here are being used to inform the development of alternatives for feasibility and environmental documents that are now in development. DWR published a state feasibility study report for the In-Delta Storage Program in 2004. No additional state or federal funding for the program has been received since then. Consequently, study results are not consistent with the Common Assumptions being used by the other investigations. Results from the 2004 In-Delta Storage State Feasibility Study Report are available at http://www.calwater.ca.gov/calfed/oversight/calfed_Oversight_IDS_2004.html.
Table #1 CALFED Surface Storage initial alternatives\(^1\) benefits summary

<table>
<thead>
<tr>
<th>Investigation initial formulation summarized here (Reservoir)</th>
<th>New storage capacity of initial alternative (thousand acre-feet)</th>
<th>Avg annual yield estimate (taf/year)</th>
<th>Yield estimate includes</th>
<th>Benefits not included in yield estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Vaqueros Expansion</td>
<td>175</td>
<td>104</td>
<td>EWA Replacement</td>
<td>-Emergency Water Supply</td>
</tr>
<tr>
<td>North-of-the-Delta Offstream Storage (Sites Reservoir)</td>
<td>1,800</td>
<td><strong>622</strong></td>
<td><strong>Total</strong></td>
<td>-Hydropower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>184</td>
<td>Urban + Ag</td>
<td>-Water Quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35</td>
<td>Refuge</td>
<td>-Fishery Protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>57</td>
<td>EWA Replacement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>170</td>
<td>Water Quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>176</td>
<td>Ecosystem Restoration</td>
<td></td>
</tr>
<tr>
<td>Shasta Lake Water Resources</td>
<td>634</td>
<td>50</td>
<td>Urban + Ag</td>
<td>-378 taf dedicated storage for anadromous fish</td>
</tr>
<tr>
<td>Upper San Joaquin Basin Storage (Temperance Flat RM 274)</td>
<td>1,260</td>
<td>177</td>
<td>Urban + Ag</td>
<td>-Hydropower</td>
</tr>
<tr>
<td>In-Delta Storage</td>
<td>217</td>
<td><strong>107</strong></td>
<td><strong>Total</strong></td>
<td>-Hydropower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>Urban + Ag</td>
<td>-Flood Damage Reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td>Groundwater</td>
<td>-Hydropower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Banking</td>
<td>-Recreation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Ecosystem Restoration</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>44</td>
<td>Refuge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water Quality</td>
<td></td>
</tr>
</tbody>
</table>

\(\text{taf} = \text{thousand acre-feet}\)

\(^1\)Initial Project Formulations are not feasibility or environmental document alternatives and are not preferred.

Potential Costs of CALFED Surface Storage

Costs have been estimated for an initial alternative for each of the CALFED surface storage investigations. The costs shown in Table #2 reflect the same initial alternative formulation as described in the benefits section above so that benefits and costs can be considered together. As noted previously, the initial alternatives shown here are not preferred, but will be used to inform the alternatives that will be selected and analyzed in the environmental and feasibility planning documents. Costs for the In-Delta Storage investigation are not shown here because they are not current. Table 2 shows the storage capacity, cost, annual cost, annual benefit, benefit – cost ratio, and an estimate of the percentage of the initial project formulation that is dedicated to environmental public benefits. Costs of the initial formulations shown range from $667 million to $4.1 billion. Benefit cost ratio is an indicator of a project’s economic feasibility. The approximate percentage dedicated to environmental public benefits is shown to indicate the portion of the project that may be paid for by the State and/or federal governments. The remaining portion of the cost of each project would then need to be paid for by local and regional water interests. In these initial alternatives, the local and regional water interests represent contractors of the CVP and SWP.
Table #2 CALFED Surface Storage initial project alternatives\(^1\) cost summary

<table>
<thead>
<tr>
<th>Investigation initial formulation summarized here (Reservoir)</th>
<th>New storage capacity of initial project formulation (taf)</th>
<th>Cost (millions)</th>
<th>Annual cost (million$/yr)</th>
<th>Annual benefit (million$/yr)</th>
<th>Benefit cost ratio (Ann. Ben/Ann. Cost)</th>
<th>Approximate percentage(^2) of initial formulation dedicated to environmental public benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Vaqueros Expansion</td>
<td>175</td>
<td>$667</td>
<td>$34</td>
<td>$45</td>
<td>1.29</td>
<td>76%</td>
</tr>
<tr>
<td>North-of-the-Delta Offstream Storage (Sites Reservoir)</td>
<td>1,800</td>
<td>$3,600</td>
<td>$189</td>
<td>$215</td>
<td>1.14</td>
<td>52%</td>
</tr>
<tr>
<td>Shasta Lake Water Resources</td>
<td>634</td>
<td>$825</td>
<td>$46</td>
<td>$75</td>
<td>1.61</td>
<td>61%</td>
</tr>
<tr>
<td>Upper San Joaquin Basin Storage (Temperance Flat RM 274)</td>
<td>1,260</td>
<td>$4,100</td>
<td>$201</td>
<td>$164(^3)</td>
<td>not available(^3)</td>
<td>8%(^3)</td>
</tr>
<tr>
<td>In-Delta Storage</td>
<td>217</td>
<td>$789</td>
<td>61</td>
<td>$28</td>
<td>0.46</td>
<td>28%</td>
</tr>
</tbody>
</table>

\(^1\) Initial Project Alternatives are not feasibility or environmental document alternatives and are not preferred.

\(^2\) Percentage is based upon preliminary cost allocation of initial alternative formulation.

\(^3\) All of the Broad Public Benefits are not yet quantified for this investigation; a portion is. A full accounting of benefits will be included in the feasibility documents. The B/C comparison is not calculated here because benefits are incomplete. The percentage of this initial formulation dedicated to environmental public benefits will increase as more public benefits are identified and allocated costs.
Major Issues Facing CALFED Surface Storage

Study Funding
Sufficient and stable State and federal funding are critical to successful completion of the feasibility and environmental studies for the CALFED surface storage investigations. California’s Proposition 50 (2002) provided initial stable State funding for the surface storage investigations; Proposition 84 (2006) provided additional funds to complete the studies. In October 2004, the President reauthorized the CALFED Bay-Delta Program. PL108-361 reaffirms federal feasibility study authorization for four of the five storage investigations (SLWRI, NODOS, LVE, and USJRBSI). In 2007, DWR received no funding to support surface storage studies for the current state budget year. However, funding of the Proposition 84 funds is anticipated to resume next year. To efficiently complete the continuing CALFED surface storage investigations, DWR has prioritized its work efforts to focus resources on identifying the most viable projects and project tasks. DWR and Reclamation will work cooperatively to evaluate projects using information associated with federal planning studies and reports. Funding instability in the past has caused delays for the investigations. Stable funding will be especially critical during this final phase.

State and Federal Interest
A continuing essential task is the identification of State and Federal interest in each of the investigations. Identification of State interest is a primary objective of state feasibility reports that will be completed soon for the investigations that DWR is participating in. DWR will identify broad public benefits (such as ecosystem restoration and sustainability of endangered or threatened species) that warrant investment by the State. Similarly, Reclamation will continue to determine federal interest in projects as the federal feasibility studies are developed. In addition, DWR and USBR are working with stakeholders to identify which projects have the greatest local interest and possible willingness to pay for project costs. The CALFED surface storage investigations will then use results of all these evaluations to develop partnerships with stakeholders to continue advancing alternatives development and plan formulation. Local and regional water entities have indicated a preference that the State and Federal governments express some commitment to potential State and Federal investments in the projects prior to their commitment. If partnerships are not formed (demonstrating lack of interest in advancing a project) and/or the outcome of technical and economic studies indicate any of the five projects are not feasible, the State and/or Federal governments may decide to defer future studies of specific projects.

Financing
Implementation of one or more CALFED surface storage projects would likely require two types of bond financing for the State. An initiative measure could approve general obligation bonds to pay for the broad public benefits such as ecosystem restoration. Repayment bonds could facilitate contractor participation in benefits to specific users. Finally, federal participation in the projects would potentially make them much more effective. Both the federal and state government could invest in restoration actions that would improve conditions for aquatic and riparian ecosystems and species that depend upon them. These dedicated restoration supplies may prove an essential element in recovery of the Delta, its tributaries, and dependent species. State and Federal fish and
wildlife management agencies would then tasked with managing restoration water supply assets. The federal government may also invest in refuge water supplies or make a capital investment in water supplies for CVP contractors.

**Recommendations to Facilitate CALFED Surface Storage Decision-making**

1. CALFED signatories and stakeholders should continue to prioritize work efforts to complete the feasibility and environmental studies of the surface storage investigations.

   - As indicated in the funding discussion above, DWR is prioritizing future surface storage work efforts due to insufficient funding to complete environmental documentation and feasibility analyses for three CALFED surface storage investigations (NODOS, LVE, and USJRBSI). Reclamation is prioritizing work on four investigations (SLWRI, NODOS, LVE, and USJRBSI). Prioritization criteria include reviewing conclusions and recommendations from ongoing State and federal planning studies; determining federal, State, and local interest, including willingness to pay; and assessing legal and logistical issues related to specific projects.
   - The investigations should continue to test potential projects against CALFED solution principles and implementation commitments as well as other local, State, and federal planning criteria for deciding to move to construction of any projects.
   - Engage more stakeholders and potential project participants in the process.
   - Develop information on how the projects could be operated for a variety of purposes, costs, and impacts.
   - Continue evaluation and presentation of operational scenarios that will allow potential participants to assess their interest in specific projects.
   - Develop mechanisms to provide assurances that projects will be operated in a manner consistent with the objectives.
   - Assess Federal, State, and local interest in the investigations, including opportunities for State and Federal investment in broad public benefits.

2. DWR, Reclamation, other CBDA agencies and local interests should continue work with related planning efforts including Delta Vision, the California Water Plan Update, and the Bay Delta Conservation Plan.

3. CBDA, DWR, and Reclamation should continue their development of conceptual finance plans that will include descriptions of relevant State and federal financial policies and a determination of the potential for State and federal investment in benefits to the general public. The scenarios and finance plans will help facilitate potential investment decisions by local, regional, State and federal decision-makers.
Selected References


