Sites Reservoir

Frequently Asked Questions *September 2007*

Department of Water Resources

California's water management system depends on surface storage, not only for water supply, but flood control, hydropower generation, and recreation. Existing surface storage is used to maintain water quality in the Delta, is operated in conjunction with groundwater storage to leverage enhanced water supply reliability, and provides an ability to respond to a variety of disasters. As California's population grows and the effects of climate change continue, new storage facilities must be built.

Governor Schwarzenegger has proposed a multi-billion dollar investment in new reservoirs that will increase our water supply, support ecosystem restoration, improve flood protection, improve water quality, and give more flexibility in dealing with climate change.

How much will it cost to build and operate the reservoir?

The total project cost is estimated at $2.3 to 3.2 billion depending on conveyance options. The annual costs for operations, maintenance and power are estimated at $10 to $21 million. These estimates are based on preliminary feasibility studies and include all capital costs for construction, engineering, administration, environmental compliance and mitigation (including the costs of relocating infrastructure), legal, real estate and contingencies.

What are the identified benefits?

Sites Reservoir will add flexibility to the state's water management system and can provide unique benefits which include:

- Enhanced water supply reliability for urban, agricultural, and environmental uses
- Improved Delta water quality
- Mitigation of snowpack storage losses due to climate change
- Contribute to flood damage reduction in the Central Valley
- Ecosystem restoration actions in the Sacramento River
- Dedicated storage that can be adaptively managed to respond to Delta emergencies and help with restoration actions

Identified benefits are continuing to evolve and will depend on the partners' needs.

Proposed Sites Reservoir

Are Sites and Temperance Flat reservoirs the best locations for new surface storage and Los Vaqueros Reservoir the best location for expansion?

Sites Reservoir and Temperance Flat are among the best locations for new multi-objective surface storage in California. Since the late 1990s, state and federal agencies have investigated 5 promising surface storage projects. Each project is capable of producing multiple benefits. Sites Reservoir and Temperance Flat are the largest projects and thus could produce the broadest array of statewide and national benefits, based on the following facts.

- State and federal agencies initially screened 52 potential surface storage sites, with many eliminated due to high costs and environmental impacts
- Five surface storage sites were selected for further study in the CALFED Programmatic EIS/EIR: Shasta Lake Enlargement, NODOS (Sites Reservoir), In-Delta Storage, Los Vaqueros Reservoir Expansion, Upper San Joaquin Basin (Millerton Lake Enlargement or equivalent)
- Sites and Temperance Flat Reservoirs would likely provide the most storage and broadest benefits (water supply, water quality, ecosystem restoration, and flood management)
- Sites Reservoir, Temperance Flat Reservoir, and Los Vaqueros Reservoir Expansion have significant local and regional support

Los Vaqueros Reservoir Expansion involves raising an existing dam. DWR, Reclamation and CCWD have recognized the Kellogg creek area in the western Delta as an ideal location for a reservoir for decades. In the early 1990's CCWD acted by buying 23,000 acres of watershed and constructing a dam and 100,000 acre foot reservoir facility to serve CCWD's water quality needs. LV's proximity to the Delta and the State and Federal water projects offers unique opportunities to provide additional Delta conveyance and south of Delta storage to California's water systems that serve the Bay Area. As recommended in the recent PPIC report, expanding Los Vaqueros Reservoir's seasonal Delta export operations would allow Delta salinity fluctuation providing significant ecological value, could operate with or without an improved Delta conveyance, and is not affected by restrictions in the recent Judge Wanger decision making it a perfect "no regrets" action to help fix the Delta.

How quickly can new surface storage be brought on line?

After appropriation of state and federal funds, there will be a two-year design phase followed by a five to seven-year construction phase, for a total of seven to nine years. The current planning schedule would have Sites Reservoir operating by 2019.

What is the impact on the environment?

Sites is an offstream reservoir that will primarily inundate grassland currently used for cattle grazing. Water for the reservoir will be diverted from the Sacramento River. Key areas of concern include effects to cultural resources and effects of winter diversions on anadromous fish species and the Sacramento River flow regime. The proposed project contains substantial fisheries enhancements such as replacing the Red Bluff Diversion Dam with state-of-the-art fish screens and pumps and increasing the Lake Shasta cold water pool. The project also includes modifications to the Glenn-Colusa Irrigation District intake and a new diversion opposite Moulton Weir. DWR and Reclamation are coordinating with the fish and wildlife agencies (Fish and Wildlife Service, NOAA Fisheries, and California Department of Fish and Game) regarding state and federal threatened and endangered species that may be affected. An Environmental Impact Report/ Environmental Impact Statement is being prepared to fully identify environmental impacts and mitigation measures. All significant adverse impacts will be mitigated or avoided where feasible.

How could surface storage assist in "saving" the Delta?

Surface storage is one component of a broad array of water management tools that includes conveyance improvements, water conservation and recycling measures, conjunctive management and groundwater storage, reoperation of existing reservoirs, water transfers, and other actions needed to build a solution to save the Delta.

Additional surface storage will provide flexibility to the state's constrained water management system, which can be operated to contribute to the long-term sustainability of the Delta ecosystem, maintain water quality and supply reliability, and prevent and plan for catastrophic failure of the Delta system. Flexibility created within the water management system will likely prove to be essential in developing solutions to Delta ecosystem challenges. With additional capacity and integrated operations, water diversion and deliveries can also be timed in ways that will allow for better response to the effects of earthquakes, floods, and climate change.

Added flexibility from storage can also improve the viability and effectiveness of water exchanges and transfers. Storage dedicated to Sacramento River restoration actions could be adaptively managed to support restoration actions in the Delta if state and federal fishery and wildlife experts agree on their priority. The health of the Delta also depends on the health of its tributaries. Improving conditions on the Sacramento River, the Delta's largest tributary, should not be ignored when considering Delta improvement measures.

How will water from Sites Reservoir be moved through the Delta?

Department of Water Resources' studies indicate that Sites Reservoir will provide significant benefits under any likely long-term Delta conveyance option that provides a stable Delta export capability. Preliminary operations studies indicate that Sites Reservoir will perform at a similarly favorable level with existing conveyance or enlarged conveyance. Future studies will be done to further evaluate the performance of Sites Reservoir with an isolated facility.

What is the cost of the water? How much more does it cost to get it over the Tehachapi Mountains?

Based on a preliminary cost allocation for one possible project formulation, water from Sites Reservoir will have an average cost of approximately $340 per acre-foot. Transportation costs an additional $140 to $150 per acre-foot to pump the water over the Tehachapi Mountains. However, it should be noted that the project can also provide many other benefits, including water quality and ecosystem restoration flow benefits whose costs are not allocated in this manner and do not require any additional conveyance costs.

If surface storage is part of the overall solution to California's water supply needs, what are the priorities among all of the options available? How important are conservation and recycling for example?

As California faces mounting water management challenges, including population growth, climate change and water quality degradation, it must invest in a diversified portfolio of water management options, as described in the 2005 California Water Plan Update. Options that will help deal with these challenges include conservation, recycling, desalination, water transfers, reoperation of existing reservoirs, groundwater management, and new surface storage. No single water management action can meet all of California's future water management challenges.

Preliminary studies indicate that new surface storage can improve water supply reliability at a lower total cost than the highest cost water recycling and water conservation options that would be needed for the most economically efficient future urban water management portfolio.

If other cost effective alternatives exist, why is the state looking at surface storage?

California needs to implement a full array of different water management actions. Each contributes in different ways to the overall reliability of the water management system. Water conservation, water recycling, watershed management, conveyance, desalination, water transfers, groundwater storage, and surface storage are all needed in a diversified management portfolio. Water conservation, one of the most cost effective actions, needs to be aggressively pursued in conjunction with surface storage and other actions. Surface storage provides a degree of operational flexibility that cannot be provided by other management actions. Surface storage is particularly useful in providing drought protection, releasing water at specific times for water quality and environmental benefits, contributing to flood management, mitigating for lost snowpack due to climate change, and responding to other unforeseen circumstances.

How can decisions on surface storage be made without final studies that better define project costs and benefits?

Existing surface storage studies already provide a wealth of information that can be used as the basis of implementation decisions on locating new storage. Since the late 1990s, state and federal agencies have performed detailed studies that have focused on five promising surface storage projects. This information has been published in a series of documents that can be found on the DWR and Reclamation project websites. The studies have determined estimated project costs and have shown that each potential surface storage project can be operated in a variety of ways to achieve a range of different benefits depending on the objectives of the project partners. The studies have also identified potential environmental impact, including biological and cultural resources that may be affected. Impact analyses and mitigation will be included in the environmental documents and permits.

Reports and summaries of these studies provide potential partners, including the state and federal governments, sufficient information to evaluate their level of interest in each project. Feasibility study reports and environmental impact reports/environmental impact statements will be completed for Sites Reservoir by the end of 2008 and for Temperance Flat in 2009. The final studies should include input from project partners so final costs and benefits can be determined.

Final decisions on project implementation will be made after the studies are completed and the projects are deemed feasible.

Why are project partners not stepping up to pay for the water supply benefits from the storage projects?

While potential project partners have been engaged in the storage investigations, none have yet committed to investing in the projects. Both Sites Reservoir and Temperance Flat are likely too large for any one agency or entity to pursue on its own. Partnerships that include state and federal participation to pay for broad public benefits will be necessary to allow groups of entities to share in project costs and benefits.

The ongoing feasibility studies will help define the cost sharing by state and federal agencies, but more is needed to provide assurances for other potential partners. A framework for investment, similar to that included in the Governor's proposal, would define the state's cost share in the Sites Reservoir and Temperance Flat projects and demonstrate to potential partners that the state government is serious about substantially participating in the projects. Based on this initial framework, cost sharing for these public benefits may pay up to one-half of the project costs, leaving the remainder to be paid by other project beneficiaries.

In addition, until now, there has been no framework for a fix for the Delta, which potential project participants may find critical to assuring that they could realize benefits from surface storage. The Governor's Delta Vision initiative, the Bay Delta Conservation Plan, the Delta Risk Management Strategy, and other initiatives including provisions of the Governor's proposal demonstrate that the state is serious about fixing the Delta. Surface storage needs to be developed in light of a Delta solution and as part of a comprehensive plan for securing statewide water reliability.

What is the estimated yield of the project?

The estimated total average annual yield of Sites Reservoir, from 2007 operation studies, ranges from 470,000 to 640,000 acre-feet per year, depending on the benefit emphasis of the project. These yields include water supply benefits for urban, agricultural and environmental uses, as well as water quality and ecosystem restoration flow actions.

Will the existing Red Bluff Diversion Dam be used to divert water to Sites Reservoir?

No. Water will be diverted directly from the Sacramento River using new screened pumps. The dam will not be needed to fill Sites Reservoir or to deliver water to Tehama-Colusa Canal water users.

Will Sites Reservoir divert most of the flow in the Sacramento River during the time when the reservoir is being filled?

Preliminary operations studies indicate that the average monthly Sacramento River flow diverted at Red Bluff (Tehama-Colusa Canal) ranges from 3.02 to 15.13 percent, at Hamilton City (Glenn-Colusa Irrigation District Canal) ranges from 0 to 5.83 percent, and at new diversion location opposite Moulton Weir ranges from 0 to 4.37 percent. The maximum monthly average diversion at any of the three locations is 35.8 percent. Flows remaining in the river would be more than the flows needed to meet all existing regulatory and diversion requirements in the river and the Delta.

Will Sites Reservoir impede salmon migration?

Currently, the Red Bluff Diversion Dam (RBDD) impounds water from about May 15 through September 15 each year for the irrigation season. This impedes the migration of adult spring-run Chinook salmon (federal and state listed as Threatened), completely blocks part of the spawning run of adult green sturgeon (federally listed as Threatened), and affects the outmigration of juvenile winter-run Chinook salmon (federally and state listed as Endangered) and juvenile green sturgeon. In addition, it is unknown how this dam affects the River Lamprey, a California Species of Special Concern.

The Sites Reservoir project includes the addition of state-of-the-art fish screens and pumps at the Tehama-Colusa Canal diversion. The RBDD barrier will no longer be necessary. This should improve conditions for anadromous fish, as well as resident native fish species in the Sacramento River.

In addition, Sites Reservoir will deliver water directly to the local service areas below Funks Reservoir. This will help improve fish passage by reducing diversions from the Sacramento River at Red Bluff (through the Tehama-Colusa Canal) and Hamilton City (through the Glenn-Colusa Irrigation District Canal) during critical fish migration periods. Sites Reservoir, through integrated operation with Shasta Lake, can also provide stable flows in the fall and winter between Keswick and Red Bluff to avoid abrupt reductions. This improved flow regime will avoid adverse conditions for spawning fall-run Chinook salmon.

How many years of hydrologic data are being used for the analyses?

The operations studies use 82 years (from 1922 to 2003) of hydrologic record. In addition, the investigation includes sensitivity analyses that vary these historic flow conditions to test possible effects of climate change, such as more winter precipitation falling as rain and less as snow.

How is evaporation being taken into account?

Evaporation for all reservoirs, including Sites, is accounted for in the operations studies. Evaporation rates are directly related to the exposed surface area of a reservoir, and wind and temperature conditions. Preliminary operations studies for Sites Reservoir show the total average annual net evaporation ranges from 25,000 to 30,000 acre-feet per water year, which is 4 to 7 percent of the total average annual yield of the project. These loss rates are comparable to loss rates associated with groundwater storage projects.

Will equipment used during the construction of Sites Reservoir contribute to global warming?

Preliminary estimates show that the equipment required to construct the earth-filled dams for Sites Reservoir, enlargement of the forebay, and the construction of a 14-mile pipeline would produce less carbon dioxide emissions than is produced, in two days, by all passenger cars currently commuting in the Los Angeles basin. However, an evaluation of any reservoir must consider all the potential benefits, costs, and impacts.

Will Sites Reservoir contribute to global warming with the use of electricity associated with pumping?

Sites Reservoir will use more electricity than it will produce. The project will recover about 75 to 80 percent of the energy that it uses with hydro-electric generation facilities. Assuming natural gas powered supply for water pumping operations, the pumping for Sites Reservoir would annually produce CO_2 emissions equal to about 1 ½ days of all passenger cars commuting in the Los Angeles Basin. As required, an evaluation of all the potential benefits, costs and impacts will be completed. Most other water management actions are also net users of energy. Sites Reservoir will generally pump water in the winter and spring when energy in the state is more abundant and demand is lower. Water will be released during the summer and fall when the demand is higher. Pumping water into Sites Reservoir creates a more constant energy demand that provides opportunities to couple with wind power sources throughout the state power grid. This so-called wind-shaping could provide a cleaner renewable source of energy for Sites Reservoir pumping operation while the hydropower developed in the summer will offset the use of other greenhouse gas emitting power supplies in the state.

Do reservoirs also release methane and CO_2?

Yes. However, the quantities are considered to be relatively small. For example, Lake Oroville, which is approximately twice the size of the proposed Sites Reservoir, annually emits the same amount of CO_2 as one-half day of all passenger cars commuting in the Los Angeles basin. Sites Reservoir, which would be located in an area of grasslands that grow and decompose annually, should produce a much smaller amount of methane or CO_2 due to inundation.

Will there be a net decrease in stream flow as a result of climate change? If so, how will new reservoirs fill?

Climate change projections for altered total annual precipitation in California through the end of this century vary. While models predicting smaller increases in temperature tend to predict moderate increases in precipitation, models predicting the greatest amount of warming also predicted moderate decreases in precipitation. All models, however, projected changes in runoff and timing. In addition, most temperature projections indicate that higher temperatures will result in higher snow elevations, and more precipitation will fall in the form of rain rather than snow, which will increase winter inflows to existing reservoirs. Therefore, more annual runoff will likely be passed through the existing reservoirs in the winter. New reservoirs would improve our ability to capture this modified winter runoff and mitigate the loss of snowpack storage.

Does the Water Plan Update say California will use less water in 2030 than today through available conservation measures? If so, why do we need additional water storage?

The Water Plan presents three future scenarios. These scenarios are “plausible futures, not forecasts.” The scenarios are instead intended to describe a new methodology approach to future water Update comparisons of both supply and demand. The scenarios show a net change in statewide demand that varies from a slight decrease to an increase of about 4 MAF per year between now and 2030. However, these estimates do not account for a continued overdraft of about 2 MAF per year from groundwater basins. If correction for groundwater overdraft is considered, the net demand increases from about 2 to 6 MAF per year by 2030.

The Water Plan Update states, “the biggest challenge for California water management remains making sure that water is in the right places at the right time. This challenge is at its greatest during dry years.” Surface storage is a measure that provides the flexibility to place water in the right place at the right time by optimizing the timing of releases to maximize water supply benefits. Both water demand and shortages occur in specific places at specific times. Multi-year droughts present the greatest challenge for water managers, because water in storage is diminished during each successive dry year. Looking at the total change in water demand for the State, while informative, is less essential than understanding a water system's ability to reliably deliver water supplies to a service area during these kind of drought conditions.

McCloud River is a designated scenic river. Would the Governor's proposal overrule that designation?

No, the Governor's proposal does not propose to change the wild and scenic protection of the McCloud River.