CVP COST ALLOCATION STUDY DRAFT ASSUMPTIONS AND APPROACH

UPDATED: JUNE 28, 2012

The following summarizes initial findings and assumptions made to date for the current Central Valley Project (CVP) Cost Allocation Study. This information will be updated quarterly to reflect analysis progress and stakeholder input.

Authority: Section 102 of Public Law 99-546 authorizes the Secretary of the Interior to undertake a cost allocation study of the CVP. As approved by the President on October 27, 1986, Section 102 provides in pertinent part that: "(2) The Secretary of the Interior is authorized and directed to undertake a cost allocation study of the Central Valley project, including the provisions of this Act, and to implement such allocations…"

Methodology: The Separable Costs Remaining Benefits (SCRB) method for allocating costs was adopted for use by Reclamation in 1954, is a widely accepted method used by water resource agencies to allocate project costs, and was used in the 1956, 1960, 1970, and 1975 CVP cost allocations. Given the history of Reclamation policy supporting the SCRB method for cost allocations, the SCRB method will be used for the updated CVP cost allocation. The SCRB method is based on the justified investment for each authorized project purpose and is the smaller of either: (1) the benefits ascribed to the purpose; or (2) the cost of the most economical single purpose alternative project which generates the same benefits as the multipurpose project.

Period of Analysis: Reclamation has streamlined the Cost Allocation Study methodology by initially only evaluating the benefits associated with a specific CVP purpose 50 years into the future from the base year. Should these benefits exceed the Single Purpose Alternative (SPA) costs for that purpose, then there is no need to look at historical benefits. If not, then historical benefits may be evaluated back to 1980 when the last major project feature was placed in service (New Melones). All estimates of project benefits and alternative costs used in the study reflect 2010 average annual price levels.

Benefits Analysis: Benefits are measured from a national perspective, as opposed to a localized increase/ improvement to society. To estimate the variation in benefits for water year types (dry, normal, and wet), Reclamation will use the results of CalSim modeling, which uses modified historic hydrology, operates to meet current regulatory requirements and considers climate change impacts on water supply, temperatures and demands as an important sensitivity analysis.

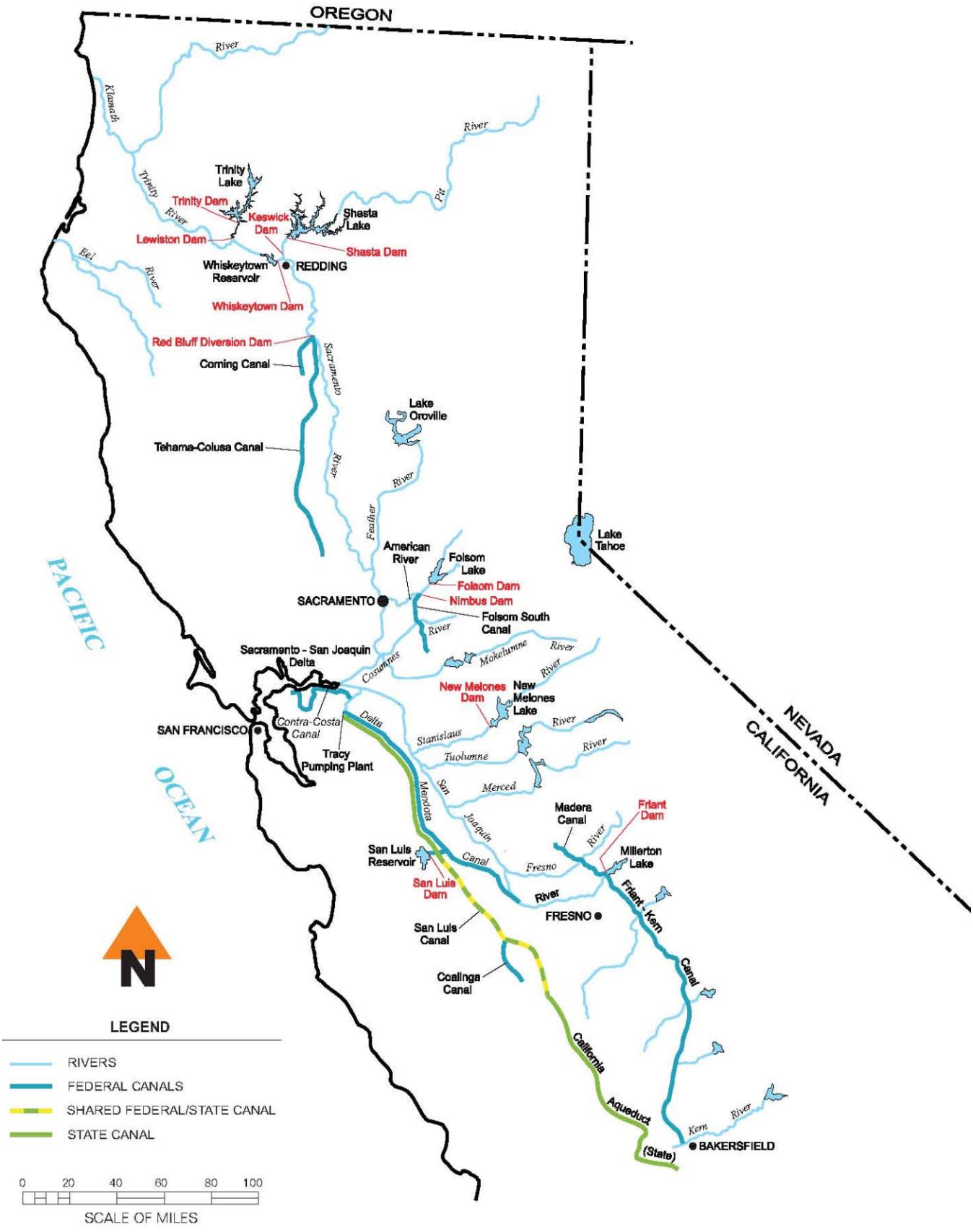
Cost Estimating: A database of existing facility costs will be developed using Bid Abstracts to identify major bid items and pricing. Costs for each CVP facility will be linked to major bid items in order to establish ratios and develop a computer-generated model of the existing facility for future sizing manipulation. Once the single purpose alternative sizing is determined, the facility will be re-sized with the computer model and material quantities extracted for re-pricing. Appraisal-level cost estimates can be completed by applying the original facility pricing to new facility sizes and indexing as appropriate.

Interest Rate: A 3 ¼ percent federal interest rate will be used in this CVP cost allocation study. This rate is consistent with rates used in past CVP cost allocation studies and complies with Section 80(b) of Public Law 93-251, requiring a December 1968 discount rate for facilities authorized prior to January 1969. The rate at that time was 3 ¼ percent.

Facilities Included: The SCRB analysis applies to CVP multipurpose facilities. Single purpose facilities or multipurpose facilities with fixed allocations are not included in the SCRB analysis.

Classification of Allocation: Under review.
Application of Allocation: Under review.
Deferred Use: Under review.

MAP OF CVP FACILITIES



FLOOD CONTROL

Benefits Analysis:
A "damages prevented" analysis of each reservoir will be completed by the U.S. Army Corps of Engineers (USACE) by indexing historic damages prevented values forward 50 years. The USACE's data has not been updated in several years therefore, the property values reflected in the damages prevented analysis are considered very conservative. Given that flood control benefit values for the CVP have historically been significantly higher than the single purpose flood control facility cost, staff is comfortable with the conservative estimates as the flood control benefits are not anticipated to be the controlling criteria used in the SCRB analysis.

Single Purpose Alternative: Dam and Reservoir

Facilities to be Analyzed: Shasta Dam & Reservoir, Trinity Dam & Reservoir, Clear Creek Tunnel, Whiskeytown Dam &Lake, Spring Creek Dam & Reservoir, Folsom Dam & Reservoir, Nimbus Dam & Lake Natoma, New Melones Dam & Reservoir, Los Banos Detention Dam & Reservoir, Friant Dam and Reservoir

Sizing Analysis: General approach is to resize each existing reservoir as a stand-alone flood control facility, based on using USACE's Flood Control Rule Curve requirements. The Flood Control Rules for maximum allowable storage are used in the CalSimII planning model. Staff will examine the time series of rules used, and find the difference between the lowest number in the data set and the actual size of the reservoir which will equal the space or size required to accommodate inflows. This is the size of the reservoir that would be required if its only purpose was to provide flood control benefits. This method does not incorporate water delivery and flow requirements downstream.

Cost Estimating: Use the cost curve model developed for each facility to estimate costs based on the facility sizes required by the facility sizing and benefits analysis results.

Major Milestones/Actions:

Task	Due Date
• Run hydrology modeling for facility sizing	Complete
• Complete flood control benefits calculations	Shasta, Folsom, New Melones complete Friant and Los Banos: Late 2012
• Develop facility cost databases and CAD models	2012 and 2013

Team Lead(s): Nancy Parker, Bureau of Reclamation – Denver TSC
Alan Stroppini, Bureau of Reclamation – Design and Construction
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NAVIGATION

Benefits Analysis:
Historical commerce on the Sacramento River resulted in a CVP authorization to maintain minimum flows of 5,000 cfs at Chico Landing to support navigation. Currently, there is no commercial traffic between Sacramento and Chico Landing, and the USACE has not dredged this reach to preserve channel depths since the 1970's. However, long-time water users diverting from the river set their pump intakes just below this level. Therefore, the CVP is operated to meet the navigation flow requirement of 5,000 cfs to Wilkins Slough (gauging station on the Sacramento River), under all but the most critical water supply conditions, *to facilitate pumping and use of screened diversions*. The CVP has little, if any, effect on the navigation of ocean-going ships calling at the ports of West Sacramento and Stockton.

The Report on Cost Allocation Study, Central Valley Project was prepared by Reclamation staff in 1988 but never approved. In that study, the USACE submitted a letter to Reclamation dated June 3, 1987, which provided a value of navigation benefits credited to Shasta Dam. The value provided was indexed from a 1959 value and no value estimates were provided for other CVP facilities.

No future navigation benefits are anticipated. Based on Reclamation's proposed methodology, some historic benefit values may be evaluated. However, since the benefit value referenced in the 1987 letter from the USACE was indexed from a 1959 estimate and not generated by more recent benefit calculations, it is probable that minimal navigation benefits were occurring at that time. Since the CVP no longer operates to meet navigation requirements, it is unlikely that the cost allocation will assign costs to the navigation purpose.

Single Purpose Alternative: *Not applicable*. Any navigation benefit value would be significantly smaller than the single purpose alternative value.

Facilities to be Analyzed: Shasta *(if applicable)*

Sizing Analysis: *Not applicable*

Cost Estimating: *Not applicable*

Major Milestones/Actions:

Task	Due Date
• Confirm CVP navigation approach	Summer 2012
• Confirmation of results from USACE	Summer 2012

Team Lead(s): Craig Stroh, Bureau of Reclamation - Ratesetting
Gary Bedker, U.S. Army Corps of Engineers

RECREATION

Benefits Analysis:
The Federal Water Project Recreation Act of 1965 (FWPRA) authorizes project joint costs to be allocated to recreation, provided that Reclamation has an appropriate cost-share partner and agreement in place PRIOR TO project authorization (FWPRA, Sec. 2). It further requires, prior to project authorization, obtaining a commitment in writing from a non-Federal public body to administer the project lands and water areas for recreation and to bear a portion of single-purpose recreation construction cost and at least half of all operating costs. Prior to 1965, only expressly authorized purposes can have joint costs allocated to them, and the FWPRA is not to be read as a general authorization for recreation at any Reclamation project.

A preliminary Solicitor's Office review of the statutes authorizing the CVP have found no express authorization to allocate joint costs of multipurpose CVP facilities to recreation, with the exception of New Melones and the Los Banos Creek Detention Dam as part of the San Luis Unit. The original act authorizing the CVP as a federal Reclamation project, 50 Stat. 844, Sec. 2, lists the expressly authorized purposes of the CVP, and does not include recreation.

For the New Melones and Los Banos Creek Detention Dam facilities, historical monthly and annual recreation visitation data (if possible, by recreation activity) will be collected for the facility. This visitation data would be statistically related to historical reservoir water levels and market area populations. Future visitation will be calculated based on estimated future water levels and projected market area populations. Estimated future visitation will be multiplied by values per visit as obtained from existing studies (benefits transfer).

The New Melones project was authorized by PL 87-874 in 1962 for construction by the USACE, but with a provision that upon completion, the project would be operationally and financially integrated into the CVP. In 1980, the project costs were transferred to the CVP when the facility was placed in service. The Solicitor's Office is currently reviewing PL 87-874 to determine if the legislation provides authorization to transfer the cost allocation responsibility from the USACE to Reclamation.

Single Purpose Alternative: Dam and Reservoir (if applicable). *The recreation benefits value is estimated to be significantly smaller than any single purpose alternative value.*

Facilities to Analyze: New Melones, Los Banos Creek Detention Dam & Reservoir

Sizing Analysis: Dam sized to provide water levels sufficient to maintain current recreation visitation

Cost Estimating: Use the cost curve model developed for each facility to estimate costs based on the facility sizes required by the facility sizing and benefits analysis results.

Major Milestones/Actions:

Task	Due Date
• Completed Solicitor's Opinions on eligibility for New Melones inclusion and recreation allocations	Summer 2012
• Collect historic visitor information/prepare recreation benefit analysis	Fall 2012
• Develop facility cost databases and CAD models	2012 and 2013

Team Lead: Jonathan Platt, Bureau of Reclamation - Denver TSC

POWER

Benefits Analysis:
CVP hydro power accomplishments will be valued in terms of benefits provided to the Western Interconnection's Bulk Electric System or regionally to California's electric grid, rather than valuing the benefits as part of the preference power customers' portfolios.

In evaluating power benefits, inputs and outputs will be constrained to reflect actual water operations. Given that the CVP is operated to maximize water supply, power is a secondary benefit and generated only when water is released to meet downstream flood control, water supply, and environmental regulatory requirements. Accordingly, power operations are not optimized, but maximized only to the extent that minimum and maximum water release constraints during each operating day can be achieved. Within those constraints, CVP hydropower plants are generally operated in a load following manner.

Power benefits will be evaluated by estimating the cost of power "avoided" by the capacity, generation and ancillary services from the hydro power plant compared to the cost of building and operating a thermal power plant, or a mix of power plants and possibly even demand-side management programs. This mix produces comparable power benefits to those produced by the hydro power plant. Historically, benefits have been presented in terms of capacity benefits in units of $/kilowatt and energy benefits in units of mills/kilowatt-hour or $/megawatt-hour. More recently, as states have instituted Renewable Portfolio Standards (RPS) mandating that a certain amount of generation (ranging between 5 percent and 33 percent) be provided by renewable resources, the mix of electricity has increasingly included non-dispatchable, intermittent resources such as wind and solar. The need for the mix of generating resources to meet load and reserves on a four second by four second basis has made hydro power more valuable because of its ability to ramp generation up and down quickly. Thus, the value of ancillary services from hydro power needs to be evaluated to the extent that the CVP is operated to provide ancillary services. Although CVP hydro power facilities provide ancillary services to the Sacramento Municipal Utility District (SMUD) as part of the Western Area Power Administration's (Western) arrangements with SMUD to operate as a sub-balancing authority (BA) within SMUD's BA, no CVP ancillary services are sold to the market because institutional and legal issues prevent third party operators such as the California Independent System Operator from actively monitoring, controlling, and/or dispatching Reclamation-owned generators. Consequently, the power benefit analysis will need to be constrained by operational conditions and not assume that ancillary services benefits can be optimized. The proposed methodology does not include an evaluation of emission benefits resulting from the avoidance of greenhouse gases in the production of hydro power because this benefit is likely offset by negative impacts on fish due to hydro power generation.

The PLEXOS model will be used to calculate CVP hydropower benefits. PLEXOS is an optimal power flow (OPF) production cost model, which simulates the dispatch of generation throughout the Western Interconnection to meet load and reserves, while respecting the constraints of the transmission system. This model is particularly good at simulating hydro power dispatch as compared to similar OPF production cost models. CVP power benefits will be evaluated starting with current electricity market conditions and extrapolating 50 years into the future. The variable component of CVP power benefits would be derived using an avoided cost approach by running the PLEXOS model with the CVP power accomplishments and then with the most likely thermal mix to replace CVP power under current and future market conditions. The resulting changes in system production costs represent the variable benefits associated with CVP power generation under current and future market conditions. The fixed component of CVP power benefits will be estimated based on the capital costs of the alternative mix of thermal power plants, which provides equivalent CVP power accomplishments, using base year costs to construct and interest during construction.

Single Purpose Alternative: Hydropower facilities in current multipurpose facility locations. Because hydro power generation is dependent on the available flow and head on the various river systems where current CVP facilities are located, it is assumed that each SPA power feature will be constructed at the same location as the current CVP facility. However, the size of the dam may be reduced and the length of the penstock increased to provide identical power benefits at least cost.

Facilities to be Analyzed: Shasta Dam & Reservoir, Trinity Dam & Reservoir, Spring Creek Dam & Reservoir, Whiskeytown Dam & Reservoir (Judge Francis Carr), Folsom Dam & Reservoir, Nimbus Dam & Lake Natoma, New Melones Dam & Reservoir

Facility Sizing: The single purpose alternative (SPA) will be sized as a dam, reservoir and power plant system providing comparable power benefits to those associated with existing CVP power features (including on-peak, off-peak and ancillary service benefits). Comparable CVP capacity benefits to be provided by the power SPA should be estimated using a dry year analysis.

- The costs of CVP transmission facilities to the principal points of delivery in the CVP will be considered as costs to be allocated. At a minimum, it would be desirable to include the cost of high voltage transmission to the Tracy load center independent of whether such facilities are owned by Reclamation or Western.

- The benefits to be replaced by the SPA are those associated with the gross production of Federal CVP power rather than the net production of power after project use is subtracted. Separable and joint costs assigned to the power function will be sub-allocated to project use and commercial power.

Cost Estimating: Use the cost curve model developed for each facility to estimate costs based on the facility sizes required by the facility sizing and benefits analysis results.

Major Milestones/Actions:

Task	Due Date
• Preview PLEXOS model to stakeholders	Fall 2012
• Complete hydrology modeling for hydropower generation	Fall 2012
• Model daily power operations	Early 2013
• Value power benefits and determine facility sizing	Early 2013
• Develop facility cost databases and CAD models	2012 and 2013

Team Leads: Mary Johannis, Bureau of Reclamation - Planning
Howard Hirahara, Western Area Power Administration

WATER SUPPLY

Benefits Analysis:
Water supply is comprised of three categories of benefits: irrigation (agriculture), municipal & industrial, and wildlife refuge, with each benefit category evaluated separately as described below:

- **Irrigation (Agriculture):** Irrigation water supply benefits will be based on farm budget analysis in compliance with the procedures described in the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G's). As stated in the P&G's, irrigation benefits are the value of increases in the agricultural output of the nation and/or the cost savings in maintaining a given level of output. The value of increases in agricultural output can be measured in a farm budget analysis as an increase in net farm income resulting from the application of irrigation water to agricultural lands compared to residual income without irrigation. Cost savings can be measured through increased production efficiencies and reduced production costs.

  Assumptions included in the benefit budget methodology include: the use long-term interest rates; capital investments are borrowed; prices received for crop sales are market-clearing prices exclusive of farm subsidies; and budgets provides a fair return to the farm operator's labor and management. The net farm income generated without irrigation is compared to the net farm income with irrigation. The net farm income remaining after subtracting production costs and an allowance for management and labor from the gross farm income is referred to as residual income. Agricultural benefits are calculated by subtracting the residual net farm income without irrigation from residual net farm income with irrigation. The difference is the agricultural benefit generated by irrigation. Data requirements include: acreage of various crops to evaluate cropping patterns, crop prices, production costs (typically obtained from county agriculture/cooperative extension offices), and changes with and without irrigation.

- **Municipal & Industrial (M&I)**: For M&I water suppliers, future use by sector (domestic, commercial, public, and industrial) will be based on historical population and business establishment trends, population projections, and economic forecasts. For those suppliers with limited historic use data, information from similarly sized suppliers will be used to either calculate percentages by sector or total use by sector based on per capita use rates. Attempts to estimate economic benefits per acre foot by sector will be based on demand curve analyses whenever possible with a fallback position based on the cost of obtaining alternative water supplies.

  1. Demand Curve Approach: Available completed M&I water studies will be used to establish applicable price elasticity of demand estimates for the affected water suppliers from which benefits can be estimated on a per acre-foot basis.
  2. Cost of Alternative Water Supply: When data limitations preclude the development of supplier specific demand curves, the costs of the most likely alternative water supply would be used as the backup M&I valuation method.

- **Wildlife Refuge:** These benefits will attempt to be measured based on their recreation value. Should the recreation value approach prove ineffective at a given refuge (due to lack of data), the backup benefit estimation approach would be an opportunity cost concept based on the value of agricultural water.

  1. Recreation Value Approach: For each wildlife refuge, historical monthly and annual recreation visitation data (if possible, by recreation activity) will be collected. Water supply data will be gathered for the same period as the visitation data. Statistical relationships between visitation and water delivery data and/or regional population will be estimated (based on a market area of visitation by county or professional judgment). Assuming a relationship between visitation and either water deliveries or population, future visitation would be estimated and multiplied by values per visit as obtained from existing studies (benefits transfer).
  2. Opportunity Cost Approach: If a lack of data precluded estimating future recreation visitation, then the value the wildlife refuge water deliveries would be based on the most likely alternative use of the water. Since agriculture is the dominate water user in the state, it is assumed that the water would have been used for agricultural purposes had it not been used by the wildlife refuge. As a result, this approach values the future refuge water deliveries based on the average agricultural value per acre foot.

Single Purpose Alternative: Dam and Reservoir

Facilities to be Analyzed: Shasta Dam & Reservoir, Trinity Dam & Reservoir, Clear Creek Tunnel, Whiskeytown Dam & Reservoir Spring Creek Dam & Reservoir, Folsom Dam & Reservoir, Nimbus Dam & Lake Natoma, New Melones Dam & Reservoir, Friant Dam & Reservoir, Tehama-Colusa Canal

Facility Sizing: Water supply benefits and single purpose alternative (SPA) facility sizing are based on water deliveries achieved with the multipurpose project. Water deliveries will be defined by CalSim model results which reflect multipurpose project operations under a consistent set of regulations and facilities rather than historical delivery levels which have varied over time due to changing criteria and system configurations. The following steps are required to analyze SPA facility sizes for water supply:

- Construct a "Cost Allocation CalSim" (CACalSim) model with the single purpose of meeting project deliveries which are fixed to those under the current regulatory environment. The model will determine the reservoir sizes required to facilitate deliveries. The effects of regulations and other project operations are implicitly captured in the level of delivery that is met. Isolating the delivery purpose and operating theoretical storage facilities to meet only this purpose provides the single purpose facility sizes.

- CACalSim model runs can also provide a range of analysis options, including:

    - Unique categories of delivery, such as agricultural, M&I, & refuge
    - Varying relative sizes of project reservoirs
    - Effects of regulatory environment – SPA facilities could be sized for delivery levels achieved under D-1485, CVPIA, and D-1641

Cost Estimating: Use the cost curve model developed for each facility to estimate costs based on the facility sizes required by the facility sizing and benefits analysis results.

Major Milestones/Actions:

Task	Due Date
• Complete water delivery model runs for benefits and sizing	Fall 2012
• Complete Irrigation benefits analysis	Early 2012
• Develop facility cost databases and CAD models	2012 and 2013
• Complete M&I benefits analysis	Early 2013
• Complete Wildlife Refuge benefits analysis	Early 2013

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WATER QUALITY

Benefits Analysis:
The CVP maintains increased flows in the Trinity, American, and Stanislaus rivers to improve the fisheries habitat and water quality conditions. Flow conditions in the lower reaches of the Trinity, American and Stanislaus rivers are maintained under flow requirements set by the California State Water Resources Control Board (SWRCB). These costs are generally embedded in the daily costs of operating and maintaining the CVP and for the most part, reimbursed by the authorized water and power beneficiaries. The costs of providing increased flows in the Stanislaus River however, are deemed non-reimbursable and assigned to the water quality purpose for the New Melones Unit.

The CVP is currently responsible for meeting its share of the salinity outflow standards set for the Sacramento-San Joaquin Delta. The standards are included in the SWRCB Water Rights Decision 1485 (D-1485) and Decision 1641 (D-1641). The costs of meeting D-1485 water quality standards are reimbursable by water and power contractors. Public Law 99-546, Section 102 (c) (1) dated October 27, 1986, states "the costs for providing water for salinity control and for complying with State water quality standards above those standards identified in the previous sentence (D-1485) shall be non-reimbursable." Meeting D-1641 water quality standards requires exceeding those of D-1485, which could therefore be interpreted as non-reimbursable costs.

Based on Reclamation's initial review with the Solicitor's Office, Reclamation "costs" as referenced in the law are interpreted as costs borne by Reclamation to meet water quality standards, such as construction of conveyance infrastructure and additional staffing. Water quality monitoring stations incurred construction and staffing costs that are designated as nonreimbursable. However, there have been no other significant costs incurred by Reclamation to meet these water quality standards. The opportunity cost of water supplies diverted from irrigation or M&I purposes are not eligible as non-reimbursable costs.

It is recognized that the CVP provides additional water quality benefits during critically dry years. Staff will continue to explore options for evaluating these benefits that may be considered as water quality benefits.

FISH AND WILDLIFE

Benefits Analysis:
During the last attempt to update the CVP cost allocation study, U.S. Fish and Wildlife Service (FWS) did not participate in the study and provided a letter dated May 4, 1987, stating that "…it is probably inappropriate to assign any project costs to fish and wildlife purposes considering the negative impact that the CVP has had on fish and wildlife." Furthermore, the letter stated, "After fish and wildlife losses associated with the CVP have been compensated for, it will be appropriate to begin assigning enhancement benefits to fish and wildlife."

To date, the FWS has not responded to requests to participate in the current CVP cost allocation study. Reclamation staff will continue to pursue coordination opportunities throughout the duration of the effort, but it is unlikely that any analyses completed would result in assigned costs to the fish and wildlife purpose.

Facilities to be Included in the CVP Cost Allocation Study

CVP Multipurpose Facilities To Be Evaluated*	CVP Authorized Purposes To Be Evaluated						
	Flood Control	Navigation	Water Supply	Power	Fish & Wildlife	Recreation	Water Quality
Shasta Dam & Reservoir	X	X	X	X			
Trinity Dam & Reservoir	X		X	X			
Clear Creek Tunnel	X		X	X			
Whiskeytown Dam & Lake	X		X	X	X		
Spring Creek Dam & Reservoir				X	X		
Folsom Dam & Reservoir	X		X	X			
Nimbus Dam & Lake Natoma	X		X	X			
Los Banos Creek Detention Dam & Reservoir	X		X			X	
Friant Dam & Reservoir	X		X				
New Melones Dam & Reservoir**	X		X	X	X	X	X
Tehama-Colusa Canal			X		X		

* CVP single-purpose facilities such as power pumping plants, water conveyance canals, and dedicated fish hatcheries, as well as facilities with fixed repayment allocations (San Felipe) are not subject to a cost allocation update.

** Pending determination on the facility's eligibility for inclusion in the cost allocation update.