Chapter IV
DEVELOPMENT OF ALTERNATIVES

As discussed in Chapter II, several methods are available to allocate the joint costs of multi-purpose projects. As an initial step in this study, a number of cost allocation methods (discussed in economics and water resources literature) were surveyed and qualitatively evaluated for possible application to the CVP. A summary of these evaluations is included in this chapter. As a result of these evaluations, certain alternatives were selected for numerical evaluation (i.e., allocations using CVP costs were prepared), with the results presented in Chapter V. This chapter provides descriptions of the allocation methods considered in more detail and discusses their applicability for use in allocating CVP costs and their potential application in this study.

CRITERIA FOR DEVELOPMENT OF ALTERNATIVES

The purposes of this allocation study guided the development of alternatives. As stated in Chapter I, the purposes are to comply with the requirement of P.L. 99-546 and to recommend revisions to the existing CVP cost allocation that will result in a streamlined process as suggested by the GAO.

Compliance with P.L. 99-546

The provisions of P.L. 99-546 directed the Secretary to operate the CVP in coordination with the State to meet salinity standards in the Delta. The standards were defined in SWRCB Decision 1485 (D-1485). P.L. 99-546 stated that costs necessary to comply with D-1485 salinity standards in the Delta should be allocated to project purposes and reimbursed in accordance with existing Reclamation law and policy. The law also stated costs necessary to meet salinity standards above those included in D-1485 should be non-reimbursable.

Shortly after passage of P.L. 99-546, Reclamation conducted hydrologic simulations of CVP operations to compare the effects of the COA operations to meet D-1485 standards with a base condition without D-1485 standards. The results of these analyses showed that the CVP could be re-operated to satisfy D-1485 requirements with no reductions in the water deliveries for long-term water service contracts. Based on these results, no additional "cost" would be incurred to comply with the law, and therefore, no change in the allocation of CVP costs was considered necessary.

In 1994, the Federal and State governments signed an accord to jointly operate the CVP and SWP, respectively, to meet the requirements of a more stringent water quality objective, as presented in the 1994 Delta Water Quality Control Plan (Bay-Delta Plan). The agreement stated that the Federal portion of the water to comply with the Bay-Delta Plan would be credited toward the amount of water to be dedicated to anadromous fishery protection under section 3406(b)(2) of the CVPIA.

Recommendations in the GAO Report

In its 1992 report, the GAO recommended the use of less costly and more streamlined methodologies to complete the CVP cost allocation study. As described in Chapter III, Reclamation has implemented numerous improvements to the spreadsheets used to complete the annual updates of the existing CVP interim cost allocation. These improvements are of two types: to correct errors previously not recognized in the allocation of project costs and to significantly reduce the time and effort to complete the allocation update computations.

The GAO also suggested two alternative approaches for the allocation of joint costs that were intended to simplify and streamline allocation computations. One method would allocate joint costs in direct proportion to specific costs assigned to each project purpose. The second method would

allocate joint costs on the basis of use and assumes that the uses of each facility for each project purpose can be accounted separately. The problem with this second method and the reason why it is not considered viable is that for some facilities there is no common unit of measurement for such an apportionment. For example, although the storage capacity of reservoirs formed by dams can often be apportioned between flood control space and water storage, such facilities are also used for hydropower production with no specific reservation of reservoir storage space for power production.

As discussed in the following sections, both allocation methods suggested by the GAO were considered in this study. The one viable GAO method, the allocation of joint costs in proportion to specific costs, was carried forward for evaluation.

ALLOCATION METHODS CONSIDERED

A variety of methods exist to allocate costs of multi-purpose projects among project users and beneficiaries. The use of different methods often gives different results. Each method has certain advantages and limitations. As described in Chapter II, no single method had been established for the allocation of costs of Federal multi-purpose water resources projects during the first half of the 20th century when many projects were in the planning stage. The resulting variation often triggered intra-agency and interagency disputes related to the selection of allocation methods. Because the selection of a cost allocation method could affect the apparent financial viability of a project, it has been said that allocation methods were sometimes used to promote the development of those project purposes with the most organizational support.

In 1954 Reclamation adopted the SCRB allocation method. Prior to that time, several other procedures had been employed. Although they are no longer used, previously used techniques, as discussed below, can be useful for understanding the use and advantages of the SCRB method. In the development of alternatives, several historical and relatively recent allocation methods were reviewed and considered for potential application to this study or for recommendation in subsequent studies.

As noted in Chapter I, the central challenge of the cost allocation process is the allocation of joint costs, and the following sections describe a variety of approaches to allocate joint costs of multi-purpose projects. Some of these methods are described simply to provide historical perspective of the issues involved in the allocation of CVP costs while others could possibly be viable methods for application to the CVP. Again, as noted in Chapter I, the scope of this study limits Reclamation's ability to undertake a complex reallocation of joint costs at this time. However, a thorough review of potential allocation methods was completed to identify methods that may be applicable in whole or in part for the purposes of this study. The methods are not presented in order of potential application or preference.

In general terms, cost allocation methods considered in this study can be organized into four groups: quantity-based methods, priority-based methods, benefits-based methods, and user- group methods. Quantity-based methods are founded on the premise that joint costs can be shared in proportion to physical characteristics or the costs of single-purpose facilities. These approaches are relatively simple to comprehend, but often difficult to apply in practice. Priority-based methods assume that project purposes can be ranked in order of priority, and joint costs can be allocated based on these priorities. Benefits-based methods consider the benefits of a project or can employ measures of alternative costs to achieve the benefits for each purpose. Although benefits-based methods are more complex and time-consuming to apply, they provide a common base (dollars) on which to measure benefits for a variety of purposes. User-group methods focus on cost allocation arrangements under which different user groups, representing project purposes, would join together to pursue a multi-purpose project.

Quantity-Based Methods

Some early cost allocation procedures were based on measurable physical criteria such as "use of space" or "water released." For application to multi-purpose projects, however, it was found that such approaches often did not adequately measure the extent of use by the various purposes involved. For example, it was difficult to compare the use of reservoir space reserved for water storage with that used for flood control since the former had no specific reservation in CVP reservoirs. The physical approach was also found to be unsatisfactory because it did not provide a common denominator for all purposes involved. For example, physical measurement procedures do not adequately recognize that fish and wildlife benefits can be realized without the release of additional water over the amounts used for irrigation, power generation, and flood control.

Each of the following methods utilizes a quantity (physical or financial) associated with facilities to allocate joint costs. The advantages and disadvantages of each method are described.

Use of Facilities – The use of facilities method is based on the premise that joint costs should be allocated among the various purposes in proportion to their amount of "use" of the multi-purpose facilities. Two different approaches may be taken in determining the meaning of the term "use." The first is related to capacity of a project facility, or "readiness to serve." The second concerns the quantities of water actually involved. As an example, consider a canal that serves water to both irrigation and M&I users. Although irrigation and M&I are considered as a single-purpose (water supply) in the CVP cost allocation, it provides a good example of the application of this method.

Under the capacity-driven approach, the canal cost would be assigned to the two functions (irrigation and M&I) in proportion to the canal capacity required by each to meet its peak flow demands. In practice, neither function would use its entire capacity all of the time, but the canal would be scaled in size to meet "peak" combined demands, which usually occur in midsummer. The chief merit of this method is that it charges each function according to the magnitude of its use or its "readiness to use." However, application to a true multi-purpose facility, such as a reservoir, would require an estimate of costs for single-purpose projects, as described in a subsequent method, and as noted previously such effort was beyond the scope of the study. Because of this and because of the problems with capacity-based measures generally (discussed above), capacity-driven use of facility method was dropped from further consideration.

Under the quantity of water approach, the canal costs would be allocated to the irrigation and M&I functions proportionate to the actual quantity of water delivered for each purpose during a year. This approach is currently applied in the sub-allocation of CVP water supply costs among M&I, irrigation, and wildlife refuges, and is utilized in the allocation of water supply facilities in the San Luis Unit and San Felipe Division. Therefore, this method is retained for application in the sub-allocation of CVP water supply costs.

Reservation of Dedicated Space – This method would allocate joint costs among project purposes based on the proportional reservation of the facility for each purpose. This method may appear well suited for the allocation of dam and reservoir costs but requires a common unit of measurement for all project purposes. For the CVP it may be most applicable for allocating costs to the flood control purpose since storage space is reserved for flood control. This method, however, cannot be used to allocate the costs of CVP dams and reservoirs to other project purposes because the operation of the CVP includes no explicit reservation for recreation, water supply, fish and wildlife, navigation, power, or water quality. This method was retained for possible use in "creating" a separable cost for flood control in the development of an alternative for further consideration.

Separate Projects Method – The separate projects method may divide either (1) the total cost of a project or (2) the joint cost (after first allocating the specific or separable costs to the purposes) in proportion to the cost of obtaining the same project benefits by constructing suitably sized

single-purpose projects. Because alternative projects need not be justified this method may produce unreasonable results – a limitation that has prevented wide acceptance of this method. Due to its limited acceptance and the significant effort that would be required to develop conceptually separate projects, this method was dropped from further consideration.

Equal Apportionment Method – Since there is no fixed mathematical formula for allocating costs, this method apportions either all of the costs of the project, or its joint costs, equally among the purposes. Obviously, the results of such a method could be considered arbitrary and even unreasonable unless the respective purposes produced benefits that were approximately equal. For example, it could easily result in an allocation in which one project purpose was allocated costs greater than the benefits received. Since this method was considered arbitrary, it was dropped from further consideration.

Priority-Based Methods

The following methods are based on the assumption that multi-purpose projects are designed and operated to meet a primary purpose and that all other purposes are subsidiary.

Priority of Use Method – The priority of use method is based on the premise that when a project is operated primarily for one purpose and secondarily for another, the primary purpose should be assigned a greater portion of the cost. In all multi-purpose projects, the various purposes compete with each other to some extent for the use of water or storage space. The purposes have different time requirements for the periods of optimum release and storage of water; thus, all of them cannot be served in the most advantageous manner. If this method were to be developed, significant study would be required to evaluate potential project operations under a variety of prioritization schemes. This approach would be needed to identify the extent to which priority is given to each project purpose. Furthermore, at least in the case of the CVP, these priorities may change over time, further complicating a determination of the way to apply the method. The recognition that multi-purpose facilities of the CVP are often operated to meet multiple priorities and that significant cost would be required to complete a series of operations studies suggests that this method may not be appropriate for the allocation of CVP costs. Therefore, this method was dropped from further consideration.

Incremental Method – The incremental method allocates the separable costs to their respective purposes and the total joint cost to one basic purpose, considered to be the principal or basic purpose of the project. An example would be found in a multi-purpose project serving flood control, irrigation, and electric power. If flood control were identified as the primary purpose, flood control would be allocated its separable cost plus all of the joint costs. Then, the irrigation and power purposes would be allocated only their respective separable costs. This method is not considered applicable to the CVP since the project was not authorized nor is operated to meet a primary purpose. Therefore, this method was dropped from further consideration.

Specific Costs Method – The specific cost method is a variation of the incremental method. Instead of allocating separable costs to the incidental purposes, only specific costs are allocated to those purposes. The remaining joint costs are then assigned to the primary purpose. Using this method may be justified where a purpose is added after a project has been completed. For example, dams are sometimes built containing penstocks, but no other facilities for power generation. When generation facilities are added after passage of a number of years, they might legitimately be considered to be a new project. This "new project" concept might utilize the specific costs method of allocation. This method is also not considered applicable to the CVP since the project was not authorized, nor is it operated, to meet a primary purpose. Therefore, this method was dropped from further consideration.

Benefits-Based Methods

Because of the limitations inherent in the use of measurable physical criteria, attention was focused on approaches based on benefits. Theoretically, there are many advantages to the benefits concept because it not only measures the extent of use but

also provides a common denominator for all purposes involved. However, a method strictly based on benefits does not recognize the possibility of securing comparable effects at less cost through alternative means. Thus, methods that recognize both benefits and alternative costs have been developed and reviewed below. The AJE method and the SCRB method are examples of methods that combine benefits and alternative costs.

Each of the benefits-based methods discussed below depends on the benefits obtained from the various purposes served. All three approaches limit the cost allocated to any purpose so that it will not exceed the corresponding benefits. A principal difficulty in all the procedures is the necessity of estimating all benefits on a comparable basis and stating them in monetary values.

The Benefits Method – The benefits method allocates the total cost of the project among the various purposes in proportion to their estimated benefits. This assumes that the entire project can be considered a joint cost. Another procedure also referred to as the benefits method first allocates specific costs to each purpose, then allocates a share of the joint cost in direct proportion to the estimated net benefits accruing to it. The latter procedure is similar to the AJE method described below.

Alternative Justifiable Expenditure Method – The AJE method fundamentally and indirectly rests on an estimate of benefits, but it is directly based on the justified investment for each purpose. The maximum justified investment is the smaller of either (1) the benefits ascribed to the purpose or (2) the cost of the most economical alternative single-purpose project which would achieve substantially the same benefits as does that purpose in the multi-purpose project. The lesser of these two amounts, called the alternative justifiable expenditure, represents the largest investment that could be justified for a purpose in the multi-purpose project. This means that no more should be spent on any project purpose than (1) the value of the benefits it will produce, or (2) the cost of producing those benefits by the least expensive alternative source. The approach is used to establish the maximum cost allocated to each project purpose. The minimum allocation to each project purpose is the specific cost incurred for each purpose.

Examples of single-purpose alternative projects are thermal instead of hydro powerplants, rail instead of water transportation, and levees instead of storage space for flood protection. The alternative projects are hypothetical, and there are instances where an alternative for one purpose is located within the same space as the alternative of another, which is a physical impossibility. However, this does not prevent the use of the estimated costs of these alternatives in allocating the investment in a multi-purpose project.

After the maximum justifiable investment is determined for each purpose, the respective specific costs in the multi-purpose project are subtracted from it. Specific costs are the costs of individual physical features that serve only a single purpose. The balance is called the remaining justifiable expenditure. The joint cost–which is the total project cost minus the sum of all the specific costs--is allocated among the various purposes in direct proportion to the remaining justifiable expenditures. Each allocated joint cost is then added to its respective specific cost in order to arrive at the total allocation to each purpose.

The AJE method has several advantages. First, no purpose is assigned costs greater than the value of its services or costs less than its specific costs. Second, AJE may be tied closely to the project's original formulation procedure by use of the same single-purpose alternatives and benefits for each purpose. If a significant period of time has passed since the original project formulation, however, the benefits and appropriate single-purpose alternative may have changed.

The AJE method, however, has two major shortcomings. First, because of budgetary and staffing constraints, the cost of alternative projects generally will not receive as thorough an investigation as will a project contemplated for construction, and, second, the economic basis for this method is uncertain because it is usually impossible for all of the alternative projects to coexist. These shortcomings raise questions as to whether the alternatives are, in fact, the most economical alternative sources. Simply stated, in the absence of the multi-purpose project, all of its

accomplishments could not be realized by a series of single-purpose projects at the cost indicated in the allocation study.

Separable Costs-Remaining Benefits Method – The separable costs-remaining benefits procedure is basically a variation of the AJE method. The SCRB method uses the lesser of benefits or single-purpose alternative costs to determine the maximum allowable allocation, or justifiable expenditure, for each purpose in the same manner as AJE. However, from it the separable (instead of specific) costs are subtracted to obtain the remaining justifiable expenditure. Since separable and specific costs will often differ, the proportionate allocation of the joint costs will generally be different from that derived by the AJE.

The justifiable expenditure is the maximum and the separable cost is the minimum amount allocated to any purpose. The separable cost for each purpose is the difference between the cost of the multi-purpose project and the cost of the project with the purpose omitted. Separable costs usually include more than the specific costs of physically identifiable facilities serving only one purpose. Separable costs include all added costs of increased size of structures and changes in design for a particular purpose over structure size and design required for all other purposes. An example would be the cost of increasing reservoir storage capacity. Separable costs are usually higher than specific costs; however, the two may, on occasion, be equal. Specific costs can never exceed separable costs because specific costs are, by definition, also separable. When the two are equal, the SCRB and AJE methods are identical.

The sum of the separable costs is subtracted from the total project cost to obtain the joint cost, which is then allocated among the purposes in proportion to the remaining justifiable expenditure for each purpose in the same way as for the AJE method. Separable costs and allocated joint costs for each purpose are added together to complete the allocation process.

The SCRB method, which is very similar to the AJE method, has most of the same advantages and disadvantages. However, using separable rather than specific costs usually reduces the amount of joint costs and increases minimum allocations to project purposes.

One disadvantage is that separable costs are not easily determined and generally require extensive expense and time to estimate. For the current CVP, even historical information on specific design details, quantities, and alternative facility designs are not always available and would need to be redeveloped before separable costs could be re-computed. The extensive level of effort necessary to estimate updated separable costs was not anticipated in the budget for this study. Therefore, the development of a new SCRB-based allocation was not considered for this study, but the SCRB method, employed in earlier cost allocations, was retained because of its many advantages and because it has remained the procedure established for use by Federal water resources agencies. The use of separable and joint cost allocation factors developed in the 1975 reallocation study was retained for consideration.

User Group-Based Methods

Shapley Value Method – The Shapley value method uses information on all possible combinations of users to derive a unique cost allocation that should be acceptable to all users as long as all of the alternative cost functions are "well behaved." This latter phrase means that (1) the sum of the costs serving each user (or group of users) alone is greater than the project cost of serving them, and (2) each user (or group of users) has a benefit or alternative cost for his (their) share of the water supply that exceeds the incremental cost of providing project water to him (them).

The cost allocation for a user is derived as a weighted average of all the marginal costs of adding the user to every possible group. These groups include the "going-it-alone" option. The weights assume that every group is equally likely and are based on the number of users. The weights are one divided by the number of possible sequences in which all users could have joined the project. The number of possible sequences is N-factorial where N is the number of users. If there are four users, for example, then the number of sequences is 4 x 3 x 2 x 1 or 24, and the weights are 1/24.

The major problem with this method is that it requires not only benefit estimates but also a large number of cost estimates in the case where the number of users is large. If there are 5 or 6 users, for example, the number of required cost estimates becomes 120 and 720, respectively. The Shapely method results in a cost allocation in which each user covers its separable costs.

Game Theory Methods – Game theory is the study of the progress and outcome of games, conducted under a specified set of rules, and involving a number of players. Cooperative games are situations in which the players may be able to gain by cooperating with the other players. Cost allocation problems are much like a cooperative game. Each purpose is represented by a player, and the purpose may be accomplished for less cost by participating in the project as opposed to going it alone. If the purpose has a benefit that exceeds the minimum cost of participating (the separable cost), and if this minimum cost is less than the cost of non-participation (the alternative cost), then the player will choose to participate. The most he would pay is the separable cost plus the cost savings from not incurring the alternative cost. These methods also require not only benefit estimates but also estimates of numerous alternatives, and they tend not to be easily comprehendible.

Both Shapley Value and Game Theory methods require significant amounts of data on benefit estimates and alternative costs, extending beyond the scope of this study. In addition, they are conceptually quite complex and often a challenge to comprehend and were not considered appropriate for this study.

ALLOCATION ALTERNATIVES DEVELOPED

After completing review of the various methods described above, three alternatives were developed for evaluation in this study. These include the existing cost allocation (Existing Allocation), which will form the basis of comparison; an alternative in which joint costs are allocated in proportion to specific costs consistent with a suggestion from the GAO (Proportional Alternative); and an alternative proposed by the water and power contractors (Contractors' Proposal). (The text of the contractors' proposal is included as Appendix A.) Each of these cost allocation alternatives is described in the following sections and summarized in Table IV-1.

Existing Allocation

The existing CVP cost allocation comprises the no-action alternative and would involve continued use of the procedure described in Chapter III to allocate joint costs. In general, this alternative would utilize joint cost allocation factors based on SCRB analysis completed for the 1975 reallocation study.

Proportional Alternative

This alternative was developed based on a suggestion from the GAO and would allocate joint costs in proportion to specific costs. The costs of single-purpose facilities would be summed to determine the total specific cost for the CVP. The proportion of total specific cost incurred for each purpose would be determined and applied to total joint costs to allocate them among project purposes. The total allocation to a purpose would be the sum of specific and joint costs allocated to it.

Development of this alternative requires careful determination of total specific and joint costs. The following steps were taken to identify which costs should be included as specific or joint costs and to make adjustments to create a specific cost total for flood control. Beginning with the total project costs ($3,290 million in the 1999 allocation) the following adjustments were made. (Costs of facilities subject to adjustment and joint costs are shown in Appendix B.)

TABLE IV-1

CHARACTERISTICS OF COST ALLOCATION ALTERNATIVES

Characteristic	Existing Allocation	Proportional Alternative	Contractors' Proposal
Allocation of Joint Costs	Continues use of joint cost allocation factors as computed in 1975 SCRB.	Allocates joint costs in proportion to expenditures for specific project purposes.	Uses joint cost allocation factors computed in 1970 SCRB.
Allocation of CVPIA-dedicated water	Reduction in deliveries resulting from CVPIA implementation is reflected in historic and projected water deliveries to irrigation and M&I users.	Same methodology as existing allocation.	Reduction in deliveries resulting from CVPIA implementation is reflected in historic and projected water deliveries to irrigation and M&I users. Establishes the "environment" as a water user and includes "delivery" of up to 800,000 acre-feet per year of water to the environment. The quantification this water is based on an assumed rate of buildup designed to reflect project operations. This approach increases the total water delivery base used to sub-allocate water supply costs among repayment functions.

Characteristic	Existing Allocation	Proportional Alternative	Contractors' Proposal
Repayment of water supply costs	Repayment of water supply costs is proportional to historic and projected water deliveries to end-users over the life of the project. Water supply costs are sub-allocated in proportion to deliveries to irrigation, M&I, and wildlife refuges. Reimbursable costs associated with deliveries to wildlife refuges are distributed in proportion to repayment obligations for irrigation, M&I and commercial power customers.	Same as method-ology as existing allocation.	Same methodology as existing allocation, but applied to the increased total water delivery base as follows. A portion of the 800,000 acre-feet added to the water delivery base is considered "mitigation" and the remainder is considered "enhancement." Water supply costs associated with the "mitigation" portion of the 800,000 acre-feet are sub-allocated to the irrigation, M&I, and commercial power repayment functions using the same methodology as the existing allocation. Water supply costs associated with the "enhancement" portion of the 800,000 acre-feet are not repaid by water and power users.
Repayment of power costs	Total power costs are sub-allocated among project use and commercial power functions based on power generation and use analysis completed by Reclamation. Project use power costs are distributed in proportion to water deliveries to irrigation, M&I, and wildlife refuge uses. Reimbursable project use power costs associated with deliveries to wildlife refuges are distributed in proportion to repayment obligations for irrigation, M&I and commercial power customers.	Same methodology as existing allocation.	Same methodology as existing allocation.
Repayment of reimbursable fish and wildlife mitigation costs	Repayment responsibilities are apportioned based on the repayment responsibilities associated with capital costs associated with the "causal" facility. CVPIA cost shares set by Congress.	Same methodology as existing allocation.	Same methodology as existing allocation.

Exclude Certain Costs from Allocation – The non-reimbursable CVP cost components and authorized deferred use discussed in Chapter III amount to more than $135 million and are excluded from the portion of the proportional alternative spreadsheet that calculates the joint cost allocation factors. In addition, the State share of San Luis Unit costs, totaling $224 million, was also excluded from that portion of the spreadsheet. In summary, the costs excluded are of the following types:

- Federal share of Safety of Dams improvements
- Archeology, highway improvement
- Non-reimbursable IDC
- Capitalized movable equipment
- Buildings and service facilities
- Authorized deferred use
- State share of San Luis Unit

Exempt Certain Costs from Allocation – In the specific cost total used to allocate joint costs, it was considered inappropriate to include the costs of multi-purpose facilities constructed and allocated by the COE and transferred to Reclamation or the costs of facilities with previously fixed allocations. It was also considered inappropriate to include local distribution facilities that are subject to repayment contracts since these facilities are paid for by separate contracts and not included in the water and power rates that result from the allocation. Also distribution systems can be separated from main project facilities and could have been non-Federally financed. A total of approximately $1,123 million in costs was removed from the portion of the spreadsheet that calculates the joint cost allocation factors. A summary of features exempted is provided in Table IV-2.

Create Specific Cost for Flood Control – The removal of the costs of features shown above reduced the total of specific and joint costs to approximately $1,808 million, of which $623 million is considered joint costs and $1,185 million specific costs. No single-purpose CVP facilities have ever been constructed for flood control. Thus, although flood control is an authorized purpose of the CVP and significant flood control benefits are realized by the project, the Proportional Alternative would allocate no joint cost to this purpose. A similar problem also emerges for navigation and water quality, which are authorized purposes with no specific costs.

As a means to recognize that flood control is an important authorized purpose of the CVP, an adjustment was made to the specific and joint costs described above. The reservation of dedicated space method was used to estimate the portion of total reservoir storage capacity that is reserved for flood control and therefore not available to all other purposes. A simplified approach was selected to minimize the effort required to calculate this cost. The specific costs for flood control in three reservoirs, Shasta, Folsom, and Millerton, were calculated using a weighted-average factor based on the percent of total reservoir space reserved for flood control each month. The resulting factors were applied to the total costs for these facilities to create "specific" costs for flood control. In total, this approach shifted approximately $24 million from joint costs to specific costs for flood control, resulting in a total of $599 million in joint costs and $1,209 million in specific costs. Then the allocation of specific costs was used to determine the allocation of the joint costs. It is important to note that any changes over the life of the project in the space reserved for flood control would change the level of specific costs allocated to flood control and then the allocation of project joint costs.

TABLE IV-2

FEATURES EXEMPT FROM PROPORTIONAL ALTERNATIVE

FEATURE	REASON FOR EXEMPTION
Items transferred by the COE • New Melones Dam, Reservoir and Powerplant • Black Butte Dam and Lake • COE Repayment Assumed	Multi-purpose projects with cost allocations and repayment obligations determined by the COE.
Features Not Integral to the CVP • M&I Distribution Systems with Repayment Contracts • Irrigation Distribution Systems with Repayment Contracts • Western Interties • San Felipe Division	The repayment contracts pertain to facilities that are paid for specifically by water districts and do not, therefore, affect water and power rates. Additionally, these facilities can be separated from main project features. The costs of the Interties are repaid entirely by commercial power users. The San Felipe Division is out-of-basin and not an integral part of the water- and power-generating CVP.
Facilities with Fixed Allocations • Los Banos Dam – Federal-Only Portion • Spring Creek Debris Dam	The allocation of the costs of the Federal share of Los Banos Detention Dam and Spring Creek Debris Dam were fixed prior to 1970.

Contractors' Proposal

In October 1999, the CVP water and power contractors jointly presented a proposed alternative to allocate CVP costs for consideration in this study. Upon review, Reclamation decided to include the proposal as an alternative. The Contractors' Proposal, as interpreted by Reclamation, is based on the existing cost allocation but contains two significant components that would alter the allocation and repayment of CVP costs. First, the proposal includes the use of a slightly revised version of Base I joint cost allocation factors calculated in the 1970 reallocation study rather than the factors calculated in the 1975 study. Second, the proposal specifically takes into account the environmental re-operation of the CVP by creating an environmental water use account.

Joint Cost Factors – As noted in Chapter II, the 1970 reallocation study separated the CVP into units, or bases, with each base allocated separately, and these allocations were summed to derive the allocation for the entire CVP. Base I consisted of the Trinity River, American River, Sacramento River, Friant, Shasta, and Delta Divisions. This practice was continued in the 1975 reallocation study. Table IV-3 shows the joint cost allocation factors for Base I.

TABLE IV-3

COMPARISON OF JOINT COST ALLOCATION FACTORS FOR BASE I FACILITIES

PURPOSE	1970 ALLOCATION	1970 ALLOCATION REVISED BY CONTRACTORS	1975 ALLOCATION
Water Supply	0.54180	0.54344	0.55790
Power	0.05630	0.05883	0.21810
Fish and Wildlife	0.01920	0.02004	0.0
Flood Control	0.36120	0.35520	0.20490
Navigation	0.02150	0.02249	0.01910
Recreation	0.0	0.0	0.0
Water Quality	0.0	0.0	0.0
Total	**1.00000**	**1.00000**	**1.00000**

Note:
Totals may not be completely accurate due to rounding.

The joint cost allocation factors for the 1970 cost allocation have been revised slightly in the Contractors' Proposal. In the 1970 reallocation study, Friant Dam and Reservoir were treated in the same way as other Base I dams and reservoirs, with the result that some of Friant's cost were allocated to power. Friant, however, has no power-generating facilities. In the 1975 reallocation study, Reclamation allocated costs for Friant Dam and Reservoir costs to water supply and flood control only. The contractors adopted this approach and prepared a new allocation for Friant, and as a consequence, their version of the 1970 joint cost allocation factors differs slightly from the original. Hereafter, reference to the 1970 joint cost allocation factors in this report will mean the revised set as presented in the Contractors' Proposal.

As one can see from Table IV-3, the most significant difference between the 1975 and 1970 joint cost allocation factors concerns power and flood control. The power factor increased to 21.8 percent in 1975 from 5.9 percent in 1970 while flood control fell to 20.5 percent in 1975 from 35.5 percent in 1970. In the 1970 study, the single-purpose power alternative was a fossil fuel powerplant while a nuclear powerplant was used in the 1975 study. Power values were provided by the Federal Power Commission.

For both studies, the cost of the single-purpose power alternative was less than the value of power benefits and was used in the SCRB methodology as the justifiable expenditure. From the 1970 allocation to the to 1975 allocation, the justifiable expenditure for power more than doubled while the separable power cost, which is subtracted from the justifiable expenditure to obtain the remaining justifiable expenditure, increased by two-thirds. As a result the remaining justifiable expenditure for power increased significantly in comparison to that for other project purposes, and since the joint cost factors are based on the distribution of remaining justifiable expenditures among project purposes, the joint cost allocation factor for power increased significantly. The remaining justifiable expenditure for flood control actually fell slightly in 1975, and its joint cost allocation factor also fell.

The Contractors' Proposal recommends use of the 1970 joint cost allocation factors for Base I for the following reasons.

1. The 1970 reallocation study is the last major allocation of the CVP. Although documentation for both the 1970 and 1975 allocation studies is limited, the contractors' review of the 1970 study stated that its underlying assumptions are reasonable.

2. From the contractors' perspective, the power assumptions used in 1970 study are more representative of power industry conditions existing throughout the 1970s than those used in the 1975 study, and the 1970 powerplant assumptions are more representative of subsequent periods after nuclear energy was no longer a viable energy resource when the period of spiraling energy prices, which characterized the mid-1970s, had ended.

3. According to the Contractors' Proposal, the allocation of multi-purpose costs to flood control would be "properly restored to a reasonable and equitable level." Partial flood control studies of parts of the CVP since 1975 have given a strong indication that flood control benefits are substantially understated, even for 1970.

Environmental Water Use Account – The Contractors' Proposal maintains that the authorized purposes of the CVP have been greatly expanded and that the project has undergone significant re-operation since completion of the 1975 reallocation study. The accomplishments of the project have been altered dramatically as a result of legislation and policy decisions including the CVPIA, Endangered Species Act (ESA) listings, and Bay-Delta Plan. According to the proposal, the existing allocation method does not adequately reflect the significant new environmental benefits that have been generated by the re-operation of the project and the associated enhancement and mitigation activities that have occurred. Also, the existing allocation method does not reflect the reduction in benefits accruing to water and power users.

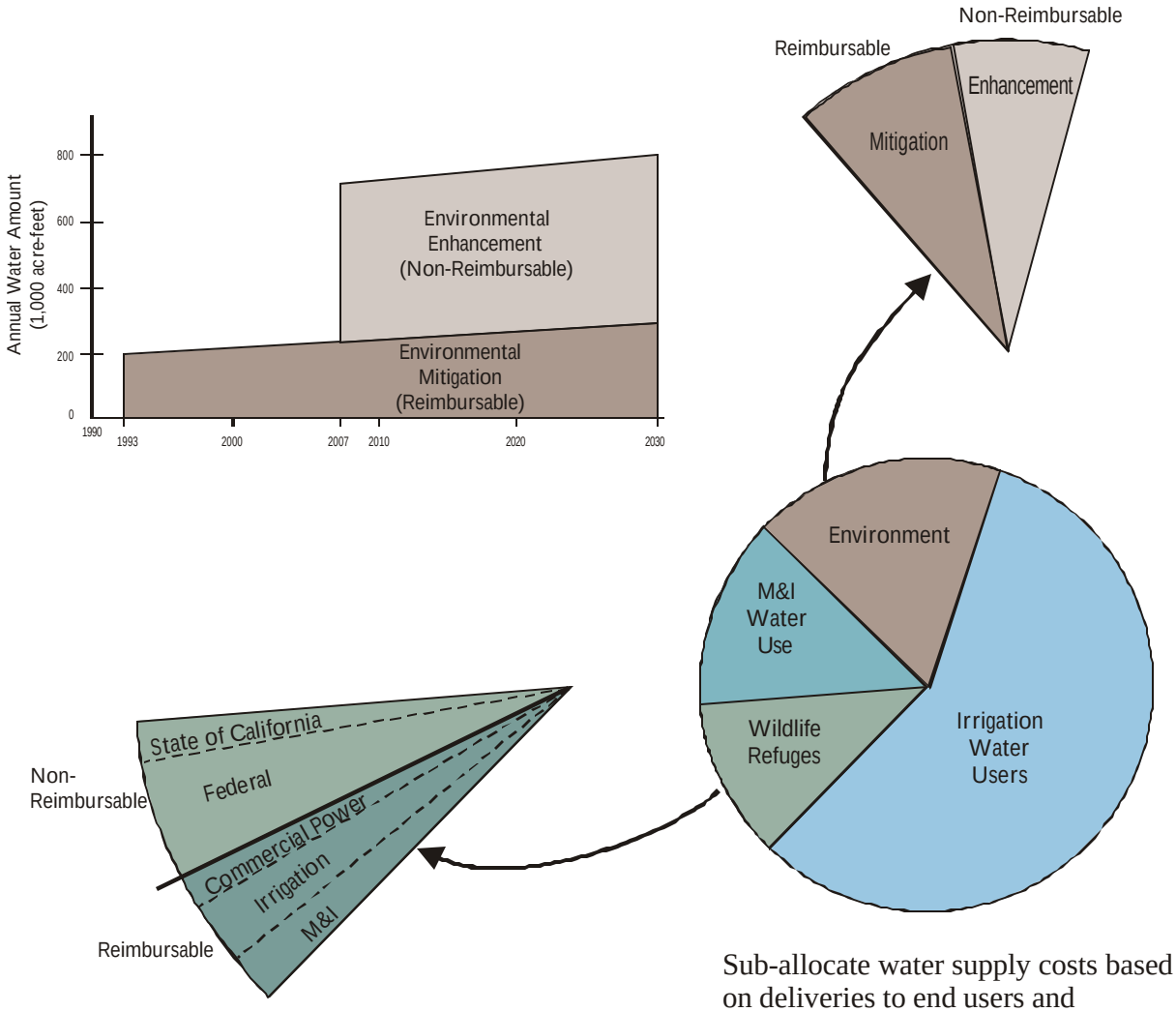
The Contractors' Proposal also contends that section 3406(a) of the CVPIA amended the Act of August 26, 1937, to establish the environment as a new project purpose. The new purpose was established to mitigate, protect, restore, and enhance the environment. As noted in Chapter II, although section 3406(b)(2) of the CVPIA dedicates 800,000 acre-feet of CVP yield toward fish and wildlife activities, it is silent on the issue of cost sharing/allocation. By contrast, section 3406(d) of the act addresses water supplies for wildlife refuges and is much more specific regarding repayment of associated costs. Reclamation's *Report on Refuge Water Supply Investigations*, March 1989, on which the refuge water requirements in section 3406(d) are based, identifies water supplies known as Level 1, 2, and 4. Level 1 supplies are a part of the larger Level 2 and refer to water rights refuges already had at the time and water supplied pursuant to the Act of August 27, 1954. Level 2 supplies were then current average annual water deliveries to refuges while Level 4 was an increment of water beyond Level 2 needed to bring the refuges to optimum management.

The first sentence of section 3406(d)(3), which addresses repayment of the costs of supplying water to the refuges, states that all costs associated with implementation of paragraph (1) of this subsection shall be reimbursable pursuant to existing law. Paragraph (1) deals with Level 2 refuge water supplies. The remainder of the subsection specifies that 75 percent of the cost of the increment from Level 2 to Level 4 will be Federal non-reimbursable and 25 percent be borne by the State. Reclamation's interpretation of section 3406(d)(3) treats the costs of Level 1 supplies as non-reimbursable while the costs of the remainder of Level 2 are reimbursable by water and power users. Reclamation considers it significant that Congress was specific in addressing the allocation of costs of refuge water supplies in the CVPIA, but made no mention of associating costs with the dedication of 800,000 acre-feet of water or of allocation of such costs.

To reflect the changes in re-operation of the CVP, the contractors propose including the environment as a new project function for the sub-allocation of costs allocated to water supply. Up to 800,000 acre-feet of environmental water dedicated by section 3406(b)(2) of the CVPIA would be treated as an additional CVP water supply, and water supply costs would be assigned to it. As noted above, section 3406(b)(2) is silent on the issue of cost sharing/allocation. The Contractors' Proposal

would treat the repayment of costs associated with the environmental water similarly to the repayment requirements specified for many of the actions mandated in section 3406(b)(4)-(23) of the CVPIA. For many of these actions, 37.5 percent of the cost is to be repaid by water and power users, 37.5 percent is a Federal non-reimbursable cost, and 25 percent is to be repaid by the State. Thus from the point of view of water and power users, 62.5 percent of these costs are non-reimbursable. The proposal would treat 37.5 percent of the costs associated with the environmental water account as reimbursable by water and power users, and the remaining 62.5 percent would be considered non-reimbursable. Since under Reclamation law the costs of fish and wildlife mitigation measures for recently constructed facilities are generally reimbursable, this cost sharing arrangement would be tantamount to treating 37.5 percent of the environmental water as mitigation water and the remaining 62.5 percent as enhancement water.

As illustrated in Figure IV-1, from 1993 through 2006, while Stage I of the CalFed environmental restoration actions are being completed, the quantity of environmental water would gradually increase each year on a schedule provided in the proposal. The proposal considers all of this water to be for mitigation, and the costs associated with it would be totally reimbursable. Beginning in 2007 when the proposal assumes that restoration actions would be complete, there would be a dramatic increase in environmental water use because enhancement would begin. The repayment of associated costs would be treated as 37.5 percent reimbursable (mitigation) and 62.5 percent non-reimbursable (enhancement). By the end of the CVP repayment period in 2030, the environmental water account would have increased to the full 800,000 acre-feet, with the costs associated with 300,000 acre-feet, representing 37.5 percent of the 800,000 acre-feet, repaid by water and power users and the remainder non-reimbursable.



Sub-allocate water supply costs based on deliveries to end users and environmental use of water dedicated by CVPIA Section 3406 (6)(2).

Distribute refuge water costs based on CVPIA-Specified Refuge Delivery Levels:

Level 1 -	Non-Reimbursable Federal
Level 2 Increment -	Reimbursable
Level 4 Increment -	Non-Reimbursable (75% Federal, 25% State)

Figure IV-1
Repayment of Water Supply Costs in Contractors' Proposal