

**Final**

# **Cost Allocation Appendix**

**Shasta Lake Water Resources Investigation**

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Bureau of Reclamation  
Mid-Pacific Region**



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## Abbreviations and Acronyms

AF	acre-feet
CVP	Central Valley Project
CP4A	Comprehensive Plan 4A
GWh	gigawatt-hour
I&A	interest and amortization
IDC	interest during construction
M&I	municipal and industrial
NRA	National Recreation Area
O&M	operations and maintenance
PEC	Program Economics, Revenues, and Contracts
SCRB	separable costs remaining benefits
SLWRI	Shasta Lake Water Resources Investigation
SWP	State Water Project

# Chapter 1

## Cost Allocation

This appendix includes a description of cost allocation terminology and methods, and an initial cost allocation and apportionment for the National Economic Development (NED) Plan , Comprehensive Plan 4A (CP4A).

### Process Overview and Terms

Allocation of Federal water resources project costs is made to derive an equitable distribution of costs among the authorized project purposes, or those purposes proposed for authorization, in accordance with existing law. This initial analysis provides an initial indication of the cost implications of constructing the NED Plan, CP4A, for each authorized purpose. It does not represent a detailed assessment of the economic effects of costs being borne by different Federal and non-Federal entities.

Basic steps associated with cost allocation and apportionment are as follows:

- Identify costs to be allocated
- Allocate costs to project purposes
- Apportion costs to beneficiaries

### Costs Allocated

Total project costs allocated include construction costs, other costs, interest during construction (IDC), annual operations and maintenance costs, and replacement costs. These costs are described in more detail in the Engineering Summary Appendix to the accompanying Final Environmental Impact Statement and are summarized below:

- **Construction costs** – Construction costs include the field costs and non-contract costs to implement all elements of the project necessary to achieve the anticipated benefits.
- **Interest during construction** – IDC accounts for the financial cost of project expenditures during the period between when construction begins and benefits are derived. IDC was calculated for the alternatives evaluated in this chapter based on a 5-year construction period.

- **Annual operation, maintenance, and replacement costs –**  
Operations and maintenance (O&M) and replacement costs are the costs required to assure continued benefits over the life of the project.

It should be noted that cost allocation is a financial exercise rather than an economic evaluation. Consequently, project costs may be presented differently in a cost allocation than in an economic analysis.

### **Allocating Costs to Project Purposes**

Once all project costs have been identified, they are allocated to the project purposes. Specific costs are for project components that contribute to a single purpose. Separable costs are the costs of the portion of multi-purpose facilities due to the inclusion of the purpose in question (e.g., higher dam embankment due to flood control purpose). Separable costs include specific costs and may include a portion of joint costs. They are estimated as the reduction in financial costs that would result if a purpose were excluded from an alternative. Remaining joint costs are the costs remaining after specific and separable costs have been removed.

Methods for allocating joint costs generally fall into one of two categories: those that consider benefits, and those that do not. Methods that do not consider benefits may divide joint costs between beneficiaries equally, or based on their share of separable costs. Methods that are based on benefits divide joint costs among beneficiaries proportional to the benefits each receives. The separable costs-remaining benefits (SCRB) method allocates costs among beneficiaries proportional to the benefits remaining after separable costs are removed. Benefits are derived in the economic analysis. Other methods for allocating joint costs based on benefits include the alternative justifiable expenditure method, and the share of total benefits method.

### **Apportioning Costs to Beneficiaries**

The cost allocation process is designed so that costs associated with project purposes can be apportioned to beneficiaries for repayment. Once costs are allocated to the appropriate purpose, costs can be assigned to Federal and/or State taxpayers (nonreimbursable) and project beneficiaries (reimbursable) based on specific project authorization, existing Federal law, existing cost sharing requirements, and laws and objectives of non-Federal entities, including states, counties, and non-profit organizations.

Reimbursable costs are those that, through some form of up-front cost sharing, repayment, or other financial agreement, are repaid to the government. Non-reimbursable costs are those borne entirely by the government. For the purposes of this initial cost allocation for CP4A, based on existing Federal law, costs allocated to irrigation water supply, municipal and industrial (M&I) water supply, and hydropower purposes are considered reimbursable by project beneficiaries. Fish and wildlife enhancement is nonreimbursable, however, Federal authorities vary on Federal and non-Federal cost-share responsibilities.

The Federal Water Project Recreation Act of 1965 (Public Law 89-72), as amended, provides for either 100 percent or 75 percent Federal financing for fish and wildlife enhancement. Existing legislation that describes Federal financial participation for purposes that could be used for allocating costs for the NED Plan, CP4A, is summarized in Table 1-1.

**Table 1-1. Existing Authorities for Federal Financial Participation for Monetized Benefit Categories of the NED Plan**

<b>Purpose/ NED Benefit Category</b>	<b>Pertinent Legislation</b>	<b>Description</b>
<b>Irrigation Water Supply</b>	Reclamation Act of 1902, as amended	Reimbursable. This act allows for up-front Federal financing of irrigation water supply purposes, with 100% repayment of capital costs and O&M costs by non-Federal project sponsor.
<b>M&amp;I Water Supply</b>	Reclamation Act of 1939, as amended	Reimbursable. This act allows for up-front Federal financing of M&I water supply purposes, with 100% repayment of capital costs (including IDC and interest over the repayment period); 100% of O&M costs are non-Federal.
<b>Hydropower</b>	Reclamation Act of 1906, as amended	Reimbursable. Similar to M&I Water Supply.
<b>Fish and Wildlife Enhancement</b>	Federal Water Project Recreation Act of 1965 (Public Law 89-72), as amended	Nonreimbursable; 100% Federal financing of all fish and wildlife enhancement areas or facilities within the Whiskeytown-Shasta-Trinity NRA.
	Federal Water Project Recreation Act of 1965 (Public Law 89-72), as amended	Public Law 89-72 allows Federal nonreimbursable share of up to 75% and non-Federal share of at least 25% for fish and wildlife enhancements outside of the NRA, including planning, design, and IDC. In addition, 50% of the annual O&M and replacement costs would be a non-Federal responsibility.
<b>Recreation</b>	Whiskeytown-Shasta-Trinity National Recreation Area (Public Law 89-336)	Provides authority for Federal development of recreation facilities in Whiskeytown-Shasta-Trinity NRA.
	Federal Water Project Recreation Act of 1965 (Public Law 89-72), as amended	Nonreimbursable; 100% Federal financing of all facilities or project modifications which furnish recreation benefits within the Whiskeytown-Shasta-Trinity NRA.

Key:  
 IDC = interest during construction  
 M&I = municipal and industrial  
 NRA = National Recreation Area  
 O&M = operations and maintenance

## Potential Cost Allocation Methods

The method of cost allocation used must be consistent with the purposes of the proposed project. For the Shasta Lake Water Resources Investigation (SLWRI), the proposed project purposes will need to be consistent with those for the existing project features and modified, as appropriate, for potential added purposes. For this initial cost allocation, project purposes for which costs are to be allocated include: irrigation water supply, M&I water supply, fish and

wildlife enhancement, and hydropower. Cost allocation considerations for fish and wildlife enhancement, flood control, and recreation are described below.

The majority of fish and wildlife enhancements for CP4A are related to supporting the survival of the anadromous fishery along the upper Sacramento River. Multiple anadromous fish species in the upper Sacramento River have been Federally listed as threatened or endangered. Accordingly, improving anadromous fish resources along the Sacramento River is viewed as having a national significance. Authorization for fish and wildlife enhancements is provided by Public Law 89-72, which specifies financial and O&M participation by a non-Federal sponsor unless the “project areas or facilities [are] authorized by law for inclusion within a national recreation area.” Therefore, SLWRI fish and wildlife enhancements within the Whiskeytown-Shasta-Trinity National Recreation Area (NRA), which includes Shasta Dam and Reservoir, would not be subject to non-Federal cost-sharing requirements. However, fish and wildlife enhancements outside of the NRA would be subject to cost-sharing requirements as indicated in Table 1-1.

For this cost allocation analysis, no costs are allocated to the flood control project purpose. It is expected that any enlargement of Shasta Reservoir would maintain flood control at a similar or slightly greater level. Because of this, benefits for flood control were not quantified, and costs were not allocated to the flood control project purpose.

Normally, for projects within the Central Valley Project (CVP), recreation would be accomplished under Public Law 89-72 with financial and O&M participation by a non-Federal sponsor. Recreation is not an identified purpose of the Shasta Division of the CVP. However, recreation is included as an important element of the Whiskeytown-Shasta-Trinity National Recreation Act, which was authorized by Public Law 89-336. Under this authorization, the Secretary of the Interior, operating through the U.S. Department of Agriculture, Forest Service, has the ability to manage lands and implement facilities to improve recreational use of the lands.

The preferred method to allocate joint costs to project purposes is the SCRB method. This requires calculation of the cost of alternative projects with each of the project purposes removed. Numerous methods exist that potentially could be used to subsequently apportion costs to Federal and non-Federal project beneficiaries. Such methods are discussed below for each of the identified project purposes.

## **Initial Cost Allocation**

The following provides an initial evaluation of how the cost of CP4A might be allocated to project purposes. The SCRB analysis shown below was performed based on information developed as part of the planning phase. Consistent with

guidance in Reclamation Manual Program Economics, Revenues, and Contracts (PEC) 01-02 “Cost Allocation,” when construction of the project is determined to be substantially complete, a final cost allocation will be performed.

### Alternative Single-Purpose Project Costs

Single-purpose project alternative cost is the cost of the most probable alternative providing the same level of benefit as the multi-purpose project. The single-purpose project cost is used to determine the limiting factor between project purpose benefits and alternative single-purpose project costs. Initial estimates of costs for single-purpose alternatives are shown in Table 1-2.

- **Irrigation Water Supply** – This single-purpose alternative would amount to an increase in the total storage capacity of Shasta Reservoir of about 296,000 acre-feet. This would be sufficient to increase the average annual CVP/ State Water Project (SWP) agricultural deliveries by about 31,400 acre-feet.
- **M&I Water Supply** – This single-purpose alternative would consist of an increase in the total storage capacity of Shasta Reservoir of about 181,900 acre-feet. This would be sufficient to allow for the CVP/SWP to increase its average annual deliveries by about 19,900 acre-feet.
- **Fish and Wildlife Enhancement** – This single-purpose alternative would consist of increasing the total storage space in Shasta Reservoir by about 270,700 acre-feet. This would allow for increasing the cold-water pool in the reservoir consistent to provide an increase in the average annual numbers of salmon in the upper Sacramento River by about 710,000 juveniles.
- **Hydropower** – This single-purpose alternative would likely include either further modifications to hydropower generation facilities at Shasta Dam or equivalent generation capacity to achieve an increase of 125 GWh per year.

### Separable Costs

Separable costs of each project purpose are the difference between the cost of the multipurpose project and the cost of a project with the purpose omitted. The separable costs shown in Table 1-3 were subtracted from the specific project purpose benefit to determine the remaining benefit in the SCRB cost allocation process. Following is a summary of each separable cost with the project purpose omitted.

**Without Irrigation Water Supply** Without irrigation water supply, an alternative would need to be at least large enough to provide for increased fish benefits and for increased M&I water supply benefits. This project would likely need some adjustment for increased modifications to provide all of the hydropower benefits of CP4A.

**Table 1-2. Summary of Estimated Costs of Single-Purpose Alternatives<sup>1,2</sup> (\$ millions)**

Item	Irrigation Water Supply	M&I Water Supply	Fish and Wildlife Enhancement	Hydropower
Alternative	Enlarge Shasta Reservoir	Enlarge Shasta Reservoir	Enlarge Shasta Reservoir	Substitute Generation
Capacity	296,000 AF	181,900 AF	270,700 AF	125 GWh
<b>Capital Cost</b>				
Construction Cost	1003	921	985	0
IDC	84	77	83	0
Total Investment	1,087	999	1,067	0
<b>Annual Cost<sup>3</sup></b>				
Interest & Amortization	39.3	36.1	38.6	0
O&M	4.3	8.4	3.6	14.4
Total	43.6	44.5	42.2	14.4

Notes:

<sup>1</sup> January 2014 price level and 3.5 percent interest rate.

<sup>2</sup> All numbers are rounded for display purposes, and therefore line items may not sum to totals.

<sup>3</sup> 100-year period of analysis.

Key:

AF = acre-feet

GWh = gigawatt-hours

IDC = interest during construction

M&I = municipal and industrial

O&M = operation and maintenance

**Table 1-3. Summary of Estimated Separable and Joint Costs for CP4A<sup>1,2</sup> (\$ millions)**

Item	Separable Costs					Joint Cost	Total Cost
	Irrigation Water Supply	M&I Water Supply	Fish and Wildlife Enhancement	Hydro-power	Total		
<b>Capital Cost</b>							
Construction Cost	93	53	162	0	308	957	1,265
IDC	8	4	13	0	25	81	105
Total	101	58	175	0	333	1,038	1,371
<b>Annual Cost<sup>3</sup></b>							
I&A	3.6	2.1	6.3	0.0	12.0	37.5	49.6
O&M	0.8	4.9	0.2	0.0	5.9	3.5	9.4
Total	4.5	7.0	6.5	0.0	18.0	41.0	59.0

Notes:

<sup>1</sup> January 2014 price level and 3.5 percent interest rate.

<sup>2</sup> All numbers are rounded for display purposes, and therefore line items may not sum to totals.

<sup>3</sup> 100-year period of analysis.

Key:

I&A = interest and amortization

IDC = interest during construction

M&I = municipal and industrial

O&M = operation and maintenance

**Without M&I Water Supply** Similar to above, without M&I water supply, the alternative would need to be at least large enough to provide for increased fish benefits and increased irrigation water supply benefits. This project would likely need some adjustment for increased modifications to provide all of the hydropower benefits of CP4A.

**Without Hydropower** Without hydropower, the alternative would need to provide all the benefits of CP4A, since the size of the dam raise is not dependent on the power component. Accordingly, the overall size and cost of this alternative would be the same as CP4A.

**Without Fish and Wildlife** Without fish and wildlife, an alternative would need to be at least large enough to provide for increased agricultural water supply and increased M&I water supply benefits. This project would likely need some adjustment for increased modifications to provide all of the hydropower benefits of CP4A.

### Joint Costs

The joint cost is the cost of facilities that serve two or more project purposes. This cost is the difference between the cost of the multipurpose project and the sum of the separable costs. The joint cost is allocated to each purpose based on remaining benefits, which are the lesser of benefits or single-purpose alternative costs minus the total separable cost. As shown in Table 1-3, the joint construction and annual costs are estimated at \$957 million and \$41.0 million, respectively. Table 1-3 also shows the total capital cost, which is then amortized over a 100-year period to develop the annual cost.

### Allocated Costs

The SCRB method allocates costs among beneficiaries proportional to the benefits remaining after separable costs are removed. Table 1-4 shows an initial estimate of the allocation of costs for the NED Plan, CP4A. As shown in Table 1-4, the allocation of construction costs is divided among the four study objectives for which costs are allocated, for a total of about \$1,265.5 million. Determination of the construction cost allocation is an essential part of the multipurpose planning process where cost-sharing is required. It provides the Federal Government with information needed to determine the magnitude and share of estimated project construction costs that are reimbursable. Cost allocation information is essential to the tests of financial feasibility and plan acceptability. During subsequent planning and construction, it provides the information required for allocating actual expenditures consistent with the plan formulation and allocation principles.

**Table 1-4. Initial Cost Allocation for CP4A (\$ millions)<sup>1,2</sup>**

Item/ Calculation	Irrigation Water Supply	M&I Water Supply	Fish and Wildlife Enhancement	Hydro- power	Total
	A	B	C	D	E
<b>Allocated Total Annual Costs</b>					
1 Average Annual Benefits	5.1	21.8	33.3	14.4	74.6
2 Single-Purpose Projects	43.6	44.5	42.2	14.4	-
3 Justifiable Expenditure (Lessor of Benefits/Single Purpose Alt Costs)	5.1	21.8	33.3	14.4	74.6
4 Separable Annual Costs	4.5	7.0	6.5	0.0	18.0
5 Remaining Benefits/Justifiable Expenditure (3) - (4)	0.6	14.8	26.8	14.4	56.6
6 % Remaining Benefits (A5 to D5) ÷ (E5)	1%	26%	47%	25%	100%
7 Allocated Joint Cost (A6 to D6) x (E7)	0.5	10.7	19.4	10.4	41.0
8 Total Allocated Costs (4) + (7)	4.9	17.7	25.9	10.4	59.0
<b>Allocated O&amp;M Annual Costs</b>					
9 Separable O&M Cost	0.8	4.9	0.2	0.0	5.9
10 Allocated Remaining Joint Cost (A6 to D6) x (E10)	0.04	0.9	1.7	0.9	3.5
11 Total O&M Allocated (9) + (10)	0.9	5.8	1.9	0.9	9.4
<b>Allocation of Capital Cost</b>					
12 Annual Capital Cost (8) – (11)	4.1	11.9	24.1	9.5	49.6
13 % Annual Capital Cost (A12 to D12) ÷ (E12)	8%	24%	49%	19%	100%
14 Allocated Capital Cost (A13 to D13) x (E14)	112.4	328.9	665.7	264.0	1,371.0
<b>Allocated Construction Costs</b>					
15 Allocated IDC [(A13 to D13) ÷ (E13)] x (E14)	8.7	25.3	51.2	20.3	105.5
16 Construction Cost (14) – (15)	103.8	303.6	614.5	243.6	1,265.5
17 % of Total Construction Cost (A16 to D16) ÷ (E16)	8%	24%	49%	19%	100%

Note:

<sup>1</sup> January 2014 price level, 3.5 percent interest rate, and 100-year period of analysis.

<sup>2</sup> All numbers are rounded for display purposes, and therefore line items may not sum to totals.

Key:

DC = interest during construction

M&I = municipal and industrial

O&M = operation and maintenance

Table 1-4 displays a step-by-step process for determining the construction cost to be allocated to each project purpose. The annual construction cost allocated to each project purpose is the total annual cost with O&M costs and interest during construction removed.

$$\text{Annual Cost} - \text{O\&M Cost} - \text{IDC Cost} = \text{Construction Cost}$$

Annual separable costs (calculated in Table 1-3) are subtracted from the total annual cost to determine the total annual joint cost. The resulting allocated joint cost is based on the percentage of the remaining benefits of each project purpose. The total allocated costs are the sum of the separable annual costs and the allocated joint costs.

A similar approach was used for developing the O&M costs, subtracting the separable costs and allocating the remaining O&M joint costs based on the percentage of the remaining O&M costs. Subtracting the O&M costs from the annual costs leaves the capital costs to be allocated to each project purpose.

Finally, IDC is subtracted to determine the construction cost allocated to each project purpose. The IDC is calculated as the percentage of the total capital cost multiplied by the total IDC. Subtracting IDC from the capital cost leaves the construction cost allocated to each project purpose.

### Cost Assignment

Table 1-5 shows an estimate of costs assigned to reimbursable and nonreimbursable project purposes for the NED Plan, CP4A, consistent with existing Reclamation law. The assignment percentages are based on existing Federal authorities included in Table 1-4. The assignment of costs includes costs to accomplish the four purposes consistent with the planning objectives. These costs amount to \$1,265.5 million. Also shown in Table 1-5, of the costs allocated for CP4A, approximately 48.6 percent are estimated to be nonreimbursable and about 51.4 percent are estimated to be reimbursable.

**Table 1-5. Initial Construction Cost Assignment for CP4A<sup>1</sup> (\$ millions)**

Purpose/Action	Total		Cost Apportionment			
			Nonreimbursable		Reimbursable	
	Percent	Cost	Percent	Cost	Percent	Cost
<b>Study Objectives</b>						
Irrigation Water Supply	8.2%	103.8	0%	0.0	100%	103.8
M&I Water Supply	24.0%	303.6	0%	0.0	100%	303.6
Fish & Wildlife Enhancement	48.6%	614.5	100%	614.5	0%	0.0
Hydropower	19.3%	243.6	0%	0.0	100%	243.6
<b>Total</b>	<b>100.0%</b>	<b>1,265.5</b>	<b>48.6%</b>	<b>614.5</b>	<b>51.4%</b>	<b>651.0</b>

Note:

<sup>1</sup> All numbers are rounded for display purposes, and therefore line items may not sum to totals.

Key:

M&I = municipal and industrial

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## Chapter 2 References

Reclamation. *See* U.S. Department of the Interior, Bureau of Reclamation.

U.S. Department of the Interior, Bureau of Reclamation. 2013 (September).  
Reclamation Manual Program Economics, Revenues, and Contracts  
(PEC) 01-02: Project Cost Allocations.

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