# Chapter 6
# National Economic Development Plan and Implementation Requirements

This chapter summarizes the NED Plan and project implementation requirements. It includes the determination of the feasibility of the NED Plan, identification of areas of risk and uncertainty, implementation requirements, Federal and non-Federal responsibilities, and project timeline.

## NED Plan

As required by the P&G, the plan with the greatest NED benefits is to be identified as the NED Plan and is usually selected for recommendation to Congress for approval, unless the Secretary of the Interior grants an exception based on overriding considerations and merits of another plan. If another plan is recommended instead of the NED Plan, such as a locally preferred plan (LPP), the NED Plan is still presented as a basis of comparison to define the extent of Federal financial interest in the plan for recommendation.

CP4A is the NED Plan based upon the evaluation and comparisons described in Chapter 5. The initial description of CP4A is presented in Chapter 4, and the following provides supplemental information on the major components and potential benefits of this comprehensive plan.

### Major Components

Major components of CP4A include the following:

- Raising Shasta Dam and appurtenant facilities by 18.5 feet.
- Reserving 191,000 acre-feet of the increased storage in Shasta Lake for maintaining cold-water volume or augmenting flows as part of an adaptive management plan for anadromous fish survival.
- Augmenting spawning gravel in the upper Sacramento River.
- Restoring riparian, floodplain, and side channel habitat in the upper Sacramento River.
- Raising the existing TCD structure and modifying the shutter control to increase the operating range or effectiveness of the structure.

- Implementing a water conservation program for the additional water supplies.

- Modifying the existing flood operational guidelines or rule curves to reflect physical modifications.

- Modifying the existing hydropower facilities at the dam to enable their continued efficient use.

- Relocation and modernization of recreation facilities to maintain the overall recreation capacity at Shasta Lake.

- Implementing the common environmental commitments described in Chapter 4 and in the Preliminary Environmental Commitments and Mitigation Plan Appendix to the accompanying EIS.

- Implementing the mitigation measures identified for CP4A which are summarized in Chapter 4 and described in detail in the Preliminary Environmental Commitments and Mitigation Plan Appendix to the accompanying EIS.

With a dam raise of 18.5 feet, the full pool elevation in Shasta Reservoir would be raised by 20.5 feet. The capacity of the reservoir would be increased by 634,000 acre-feet to a total of 5.19 MAF. Main features of the plan are summarized below:

- **Lands** – CP4A would result in an increase in full pool area of about 2,600 acres, the majority of which would be on Federal property. This amounts to an average increase in landward encroachment of water surface around the reservoir of about 50 feet at full pool. This distance would be greater along inflowing streams and creeks.

- **Clearing of Reservoir Area** – Acreage that would be inundated within the new full pool would be cleared to reduce hazards to the public and provide access to the shoreline near high-use recreation areas. This includes removing trees and other vegetation from around the reservoir shoreline. Approximately 832 acres of the newly inundated area would need either overstory vegetation removal (removing all trees greater than 10 inches in diameter at breast height or 15 feet in height) or complete vegetation removal (removing all existing vegetation).

- **Dam Crest Structure Removal** – Existing structures on the dam crest would be removed. These structures include the gantry crane, existing spillway drum gates and frames, spillway bridge, concrete in the spillway crest and abutments, parapet walls, sidewalks, curbing, crane rails, and control equipment.

- **Main Gravity Dam** – Raising Shasta Dam would be accomplished by placing mass concrete corresponding in width to the existing dam monolith blocks on the existing dam crest (concrete gravity section and spillway crest section).

- **Wing Dams** – The existing wing dams at Shasta Dam would be raised to tie the concrete gravity section into the left and right abutments. The left wing dam would be composed of compacted core material and rockfill, similar to the material used in the original wing dam construction. The upstream face of the left wing dam would include a reinforced concrete or mechanically stabilized earth wall, and a concrete parapet wall. The right wing dam would be composed of mass concrete, similar to the main gravity dam.

- **Spillway** – The three existing 110-foot-wide by 28-foot-high drum gates would be removed and replaced with six sloping, fixed-wheel gates. Four gates would be approximately 48 feet wide by 38 feet high and two gates would be approximately 54 feet wide by 38 feet high.

- **River Outlets** – Shasta Dam has 18 river outlets arranged in three tiers. The four lower tier tube valves would be replaced because of operational limitations.

- **Temperature Control Device** – Modifying the TCD at Shasta Dam would primarily include extending the main steel structure to the new full pool elevation; raising the TCD operating equipment, including gate hoists, electrical equipment, miscellaneous metalwork, and hoist platform, above the new top of joint-use elevation; and lengthening/replacing the shutter operating cables.

- **Reservoir Area Dikes** – Dikes would be constructed in the Lakeshore and Bridge Bay areas to protect Caltrans highways, the UPRR, and other infrastructure from inundation.

- **Pit 7 Project Facilities** –If a plan is authorized for construction, Reclamation would perform additional studies to further refine potential modifications to the Pit 7 Project facilities. Minor modifications are recommended for the Pit 7 Dam spillway, including raising the concrete training walls. With an increased tailwater elevation, it would be necessary to install a tailwater depression system to lower the water level in the draft tubes. Installation of an addition submersible pump in the powerhouse would collect any additional seepage. Minor modification would be required for Pit 7 Afterbay Dam and ancillary facilities. Reclamation would also provide in-kind replacement power to PG&E for reduced power generation of the Pit 7 Project due to increased tailwater elevations.

- **Railroad Bridge Relocations** – Three UPRR bridges would be relocated or modified: Doney Creek Bridge, Sacramento River Second Bridge Crossing, and Pit River Bridge.

- **Vehicle Bridge Relocations** –The following vehicle bridges would be relocated: Charlie Creek Bridge, Doney Creek Bridge, McCloud River Bridge, and Didallas Creek Bridge. Modifications to Fender's Ferry Bridge would include enlarging and extending the existing reinforced-concrete footing and pier, and modifying the existing steel tower to prevent inundation.

- **Major Roads and Road Segments** – Approximately 30 segments of roadway would be relocated, including portions of Lakeshore Drive, Gillman Road, Salt Creek Road, and other roads in the vicinity of Turntable Bay, Jones Valley, and Silverthorn marinas.

- **Recreation Facilities** – Inundated recreation facilities and associated utilities would be relocated and new facilities would be developed that meet current recreational facility standards. For recreation facilities on Federal lands, Reclamation and the USFS will consider relevant laws, regulations, policy, special use permits, and master development plans to develop and/or provide final approval for any proposed recreation facility relocations.

- **Nonrecreation Structures** – Sugarloaf and Lakeshore are the main areas with buildings that would be affected, and these structures would be demolished according to requirements of the Shasta County Department of Resource Management Building Division.

- **Utilities and Miscellaneous Minor Infrastructure** – Relocating various utility facilities, septic systems, and other miscellaneous minor infrastructure would be required, including replacing a number of reservoir area septic systems with centralized wastewater treatment plants.

## Major Benefits

Following are the major benefits of the NED Plan:

- **Anadromous Fish Survival** – Implementing the NED Plan would increase the depth and volume of the cold-water pool in Shasta Reservoir. This would increase the ability of Reclamation to make cold-water releases and to regulate water temperatures for fish in the upper Sacramento River, particularly in dry and critical years. The NED Plan includes dedicating 191,000 acre-feet of the increased storage to increasing the cold-water pool in Shasta Reservoir, which may be managed under an adaptive management plan. Improved water temperature and flow conditions are expected to increase the salmon

population by about 710,000 outmigrating juvenile salmon per year on average. The adaptive management plan may include operational changes to the timing and magnitude of releases from Shasta Dam for the benefit of anadromous fish, as long as there are no conflicts with current operational guidelines or adverse impacts to water supply reliability.

Under the NED Plan, augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat is expected to improve anadromous fish survival in the Sacramento River. Spawning-sized gravel would be applied for a 10-year period and would be placed at discrete locations in the Sacramento River between Keswick Dam and the RBPP. Riparian, floodplain, and side channel habitat restoration would be constructed at one or more suitable locations along the upper Sacramento River.

- **Water Supply Reliability** – The NED Plan would increase water supply reliability by increasing water supplies for irrigation and M&I deliveries primarily during dry and critical years. This action would contribute to replacing supplies redirected to other purposes in the CVPIA. The NED Plan would help reduce future water shortages by increasing the reliability of dry and critical year water supplies for agricultural and M&I deliveries by at least 77,800 acre-feet per year and average annual deliveries by about 51,300 acre-feet per year. In addition, water use efficiency would reduce current and future water shortages.

- **Hydropower Generation** – The higher water surface elevation in the reservoir would result in a net increase in power generation of about 125 GWh per year. Other hydropower benefits include additional capacity (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner.

- **Conserve, Restore, and Enhance Ecosystem Resources** – Adding spawning gravel and restoring riparian, floodplain, and side channel habitat are expected to improve the complexity of aquatic habitat and its suitability for anadromous salmonid spawning and rearing. In addition, improved fisheries conditions from cold-water storage and management increase flexibility to meet flow and temperature requirements, and could enhance overall ecosystem resources in the Sacramento River.

- **Recreation** – Benefits to the water-oriented recreation experience at Shasta Lake would occur because of the increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities.

- **Additional Benefits** – The NED Plan would also provide: incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River; improved Delta water quality conditions by increasing Delta outflow during drought years, reducing salinity during critical periods, and increased Delta emergency response capabilities; increase emergency response capability for CVP/SWP water supply deliveries; benefits to reservoir water quality, traffic and transportation, and public services from modernization and upgrades of relocated facilities; and long-term benefits to air quality, groundwater, Shasta Lake fisheries, and system-wide operations due to increased overall system capacity, allowing for increases in clean energy production, surface water deliveries, and storage capacity in Shasta Reservoir.

### National Economic Development Benefits

Following is a summary of the costs and benefits of the NED Plan:

- **Estimated Costs** – The estimated total construction cost is $1,265 million. The estimated total annual cost of this plan is $59.0 million.

- **Estimated Benefits** – The estimated total annual monetary benefit is about $88.9 million, assuming the cost of water and energy supplies increases at the same rate as inflation.

- **Estimated Net Benefits** – The estimated net economic benefit is about $29.9 million per year, assuming the cost of water and energy supplies increases at the same rate as inflation.

## Feasibility Determination for the NED Plan

This section summarizes the technical, environmental, economic, and financial feasibility of the NED Plan.

Feasibility determination includes the following four elements:

- Technical feasibility, consisting of engineering, operations, and constructability analyses verifying that it is physically and technically possible to construct, operate, and maintain the project.

- Environmental feasibility, consisting of analyses verifying that constructing or operating the project will not result in unacceptable environmental consequences.

- Economic feasibility, consisting of analyses verifying that constructing and operating the project would result in net NED benefits.

- Financial feasibility, consisting of examining and evaluating project beneficiaries' ability to repay their allocated portion of the Federal investment in the project over a period of time, consistent with applicable law.

The following summarizes the technical, environmental, economic and financial feasibility of the NED Plan.

## Technical Feasibility

The NED Plan is projected to be technically feasible; it is constructible, and can be operated and maintained. Designs and cost estimates have been developed to a feasibility level. A Design, Estimating, and Construction (DEC) Review was performed in August 2008 (Reclamation 2008d). Based on recommendations from the DEC review, designs and costs were refined to bring all construction features to a feasibility level. The DEC Review concluded that when the DEC recommendations were adequately addressed, the design and cost estimate for the NED Plan would be at a level suitable (i.e., feasibility level) for use for Congressional authorization and appropriation. In April 2014, a DEC Special Assessment was performed to verify completion of DEC recommendations. Recommendations from both the DEC Review and DEC Special Assessment have been addressed and resolved.

Operations of an enlarged Shasta Dam and Reservoir and other related CVP and SWP facilities would be similar to existing operations, except during dry and critical years when a portion of the increased storage in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. The NED Plan may also include adaptive management of the 191,000 acre-feet of new storage dedicated for anadromous fish survival. Adaptive management may include operational changes to the timing and magnitude of releases from Shasta Dam for the benefit of anadromous fish, if there are no conflicts with current operational guidelines or adverse impacts to water supply reliability.

Operations of other project features, which primarily include relocated infrastructure along the Shasta Lake shoreline, would also be similar to operations of existing facilities. Because the majority of project features include replacing or modifying existing facilities, minimal changes are expected in maintenance requirements for project features. Other O&M considerations include increased pumping requirements of CVP and SWP facilities for delivery of increased water supplies, operation of consolidated reservoir area wastewater treatment facilities, and in-kind power replacement to PG&E to offset reduced energy generation at Pit 7 Dam and Powerhouse.

## Environmental Feasibility

The NED Plan is evaluated in the accompanying Final EIS. Environmental effects were evaluated and mitigation measures were identified. CP4A was identified as the Preferred Alternative, consistent with NEPA, in the Final EIS (see Chapter 32 of the Final EIS).

The NED Plan would affect environmental resources in the primary and extended study areas, as summarized in Table 5-8. Beneficial effects correspond to the following resource areas: hydrology, hydraulics, and water management; water quality; fisheries and aquatic resources; socioeconomics, population, and housing; recreation and public access; transportation and traffic; and power and energy. Some of the adverse effects anticipated for raising Shasta Dam would be temporary, construction-related effects that would be less than significant or would be reduced to less-than-significant levels through mitigation. Other adverse effects would be long-term, such as effects on botanical, wildlife, and cultural resources, within newly inundated areas of Shasta Lake. Some adverse effects (e.g., the short-term generation of construction-generated emissions in excess of SCAQMD thresholds and generation of increased daytime glare and/or night time lighting) would remain unavoidable despite mitigation measures. Table S-3 in the Executive Summary of the accompanying Final EIS summarizes environmental effects and proposed mitigation for the NED Plan. The Preliminary Environmental Commitments and Mitigation Plan Appendix to the accompanying EIS describes all proposed mitigation measures for the NED Plan.

Reclamation will incorporate environmental commitments and best management practices to avoid or minimize potential effects (see Chapter 4). Reclamation will, contingent on Congressional authorization, coordinate the planning, engineering, design and construction, and operations and maintenance phases of the project with applicable resource agencies.

## Economic Feasibility

The NED Plan provides the greatest net NED benefits of the alternatives evaluated, while protecting the environment, as discussed in Chapter 5. The NED Plan is projected to be economically feasible, generating net benefits of $29.9 million annually, assuming water supply and hydropower costs increase at the same rate as inflation. Assuming an increase of water supply and hydropower costs at 2 percent above inflation to account for growing scarcity of water and energy supplies in the future and increasing demand, the NED Plan would generate $65.1 million annually in net benefits.

## Financial Feasibility

Financial feasibility determination during the planning stage consists of (1) allocating costs to project purposes, (2) assigning reimbursable and nonreimbursable costs for each identified project purpose, (3) identifying potential project beneficiaries, and (4) determining project beneficiaries' potential ability to pay their allocated and assigned costs, including capital and long-term O&M costs. This process informs the Federal decision maker of the appropriateness of the investment in individual components and the overall project.

The analysis of the financial feasibility of the NED Plan is described below. Additional information on the allocation of costs for the NED Plan is included in the Cost Allocation Appendix.

### *Cost Allocation*

Reclamation law and policy require an initial and final allocation of costs to project purposes. The initial allocation of costs is conducted to test financial feasibility of reimbursable costs during the planning phase, by comparing estimated project costs with anticipated revenues. When construction of the project is determined to be substantially complete, the final allocation of costs is conducted to determine actual reimbursable and nonreimbursable costs and is the basis for assignment of costs to beneficiaries. However, in this particular context, in light of the considerations in Chapter 9, it is recommended the non-Federal share of costs be determined prior to any final recommendation of a particular alternative. The information below is illustrative of the traditional repayment paradigm for informational purposes, but not a reflection of how Reclamation anticipates construction or repayment to occur.

The primary purpose of cost allocation is to determine the assignment of costs to beneficiaries for repayment. As reimbursement requirements differ by law among the purposes served by a project, a systematic and impartial cost allocation process is required to determine and allocate those costs that are clearly identifiable with a single purpose served, and to equitably allocate the remaining costs serving two or more purposes.

Costs to be allocated include construction costs, other costs, interest during construction, annual O&M costs, and replacement costs. 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.

The NED Plan has four project purposes: irrigation water supply, M&I water supply, fish and wildlife enhancement (e.g., anadromous fish survival), and hydropower. Project purposes for which benefits have not been monetized (e.g., flood damage reduction) are not included in this cost allocation process. Although Shasta Lake is an important element of the Whiskeytown-Shasta-Trinity NRA, costs were not allocated to recreation because it is not an identified purpose of the Shasta Division of the CVP.

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. Existing legislation that describes Federal financial participation for purposes that could be used for allocating costs for the NED Plan is summarized in Table 6-1.

For the purposes of this initial cost allocation for CP4A, based on existing Federal law, costs allocated to irrigation water supply, M&I water supply, and hydropower purposes are considered reimbursable by project beneficiaries. Fish and wildlife enhancement is nonreimbursable. As shown in Table 6-1, Federal authorities vary on Federal and non-Federal cost-share responsibilities for fish and wildlife enhancement.

**Table 6-1. Existing Authorities for Federal Financial Participation for Monetized Benefit Categories of the NED Plan**

| Purpose/NED Benefit Category | Pertinent Legislation | Description |
|---|---|---|
| **Irrigation Water Supply** | 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. |
| **M&I Water Supply** | 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. |
| **Hydropower** | Reclamation Act of 1906, as amended | Reimbursable. Similar to M&I Water Supply. |
| **Fish and Wildlife Enhancement** | 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. |
| **Recreation** | Whiskeytown-Shasta-Trinity National Recreation Area (Public Law 89-336) | Nonreimbursable; 100% Federal financing for Federal development of recreation facilities in the Whiskeytown-Shasta-Trinity NRA pursuant to Public Law 89-336. |
| | 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
NED = National Economic Development
NRA = National Recreation Area
O&M = operations and maintenance

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. Although the CVPIA includes specific actions for fish and wildlife mitigation, protection, restoration, and enhancement, CVPIA legislation and related programs (e.g., AFRP) do not specifically identify enlargement of Shasta Dam and Reservoir as a CVPIA action or program element and does not provide authority for Federal financing.

**Initial Cost Allocation** The following provides an illustration of how costs for the NED Plan could be allocated to project purposes. A separable costs-remaining benefits (SC-RB) analysis was performed to equitably allocate costs to the project purposes. The largest portion of construction costs would be expended to implement plan features required to accomplish the primary planning objectives to improve anadromous fish survival and water supply reliability.

Table 6-2 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 IDC removed.

*Annual Cost – O&M Cost – IDC Cost = Construction Cost*

Specific costs are for project components that contribute to a single purpose. Separable costs are costs that are specifically necessary because a single purpose is included in a multipurpose project. 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.

Annual separable costs 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. Total allocated costs are the sum of the separable annual costs and allocated joint costs.

A similar approach was used for developing the allocated 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. 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.

**Initial Cost Assignment** Table 6-3 shows an estimate of costs assigned to reimbursable and nonreimbursable project purposes consistent with existing Reclamation law. The assignment percentages are based on existing Federal authorities included in Table 6-2. The assignment of costs includes costs to accomplish the four purposes consistent with the planning objectives; these costs amount to $1,265 million. Also shown in Table 6-3, 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 6-2. Initial Construction Cost Allocation Summary for CP4A ($ millions)[1 2]**

| Item/ Calculation | Irrigation Water Supply | M&I Water Supply | Fish and Wildlife Enhancement | Hydro-power | Total |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| **Allocated Total Annual Costs** | | | | | |
| 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 |
| **Allocated O&M Annual Costs** | | | | | |
| 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 |
| **Allocation of Capital Cost** | | | | | |
| 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 |
| **Allocated Construction Costs** | | | | | |
| 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% |

Notes:

[1] January 2014 price level, 3.5 percent interest rate, and 100-year period of analysis.

[2] All numbers are rounded for display purposes, and therefore line items may not sum to totals.

Key:

IDC = interest during construction

M&I = municipal and industrial

O&M = operation and maintenance

**Table 6-3. Initial Construction Cost Assignment for the NED Plan[1] ($ millions)**

| Purpose/Action | Total | | Cost Assignment | | | |
|---|---|---|---|---|---|---|
| | | | Nonreimbursable | | Reimbursable | |
| | Percent | Cost | Percent | Cost | Percent | Cost |
| **Study Objectives** | | | | | | |
| Irrigation Water Supply | 8% | 103.8 | 0% | 0.0 | 100% | 103.8 |
| M&I Water Supply[2] | 24% | 303.6 | 0% | 0.0 | 100% | 303.6 |
| Fish & Wildlife Enhancement | 49% | 614.5 | 100% | 614.5 | 0% | 0.0 |
| Hydropower[2] | 19% | 243.6 | 0% | 0.0 | 100% | 243.6 |
| Total | 100% | 1,265.5 | 48.6% | 614.5 | 51.4% | 651.0 |

Notes:

[1] All numbers are rounded for display purposes, and therefore line items may not sum to totals.

[2] In addition to construction costs, interest during construction would also be assigned to M&I water supply and hydropower purposes. Although construction costs assigned for irrigation water supply are reimbursable, interest during construction is not assigned to irrigation water supply.

Key:

M&I = municipal and industrial

NED = National Economic Development

### *Payment Capacity and Ability to Pay*

Reclamation law requires that investments be repaid by the beneficiaries of that investment, except where that benefit is for the common welfare or defense of the Nation. Financial feasibility is ultimately based on the ability of project beneficiaries to collectively pay the costs associated with an implemented plan in accordance with Reclamation law. Costs beyond particular beneficiaries' repayment ability may be paid by other project beneficiaries as Reclamation policy allows and where resources are available. If beneficiaries have the collective financial resources, in accordance with Reclamation law, to pay the costs allocated to them, then the project is considered financially feasible. This ability to pay analysis was conducted to support evaluation of financial feasibility for CP4A, the NED Plan, and assesses the long-term financial capacity of project beneficiaries to absorb additional costs associated with benefits they would receive.[1]

Assessments of agricultural, M&I, and hydropower beneficiaries' ability to pay were conducted for the NED Plan. Methodologies for these analyses vary by project purpose, as summarized below:

- Typically, agricultural water users' ability to pay is based on a crop budget analysis for representative farm types to estimate farm-level payment capacity, which is aggregated to the water district level and adjusted to account for district-level O&M costs and any additional financial capacity of the district. For cost allocated to irrigation water

[1] This analysis for the SLWRI was not conducted as an ability to pay study for use in determining need for relief for individual contractors from CVP capital repayment costs and CVPIA Restoration Fund charges for a specific 5-year period.

supply for the NED Plan, an initial ability to pay analysis was conducted for representative contractors in four regions of the CVP.

- The most common measures of ability to pay for municipal water supply are the percent of water costs relative to median household income and other socioeconomic measures. For potential municipal water supply beneficiaries of the NED Plan, ability to pay and payment capacity of potential beneficiaries is estimated with an "affordability threshold" represented as a percent of median household income.

- For hydropower, it is expected that allocated costs from an enlarged Shasta Dam would increase the revenue requirement by a small percentage and the increase in rates would be supportable by those that purchase power from WAPA.

A number of observable trends also indicate ability to pay is increasing for each type of beneficiary with the potential to benefit from the NED Plan. These trends include: increasing crop prices and yields; increased plantings of higher-valued permanent crops throughout the State; repayment of existing CVP facility capital costs by 2030; and, increasing California populations. Costs that would be included in irrigation ability to pay analyses include the cost of all water supplies, including the use of groundwater wells and other sources of surface water, and existing CVP obligations. Because the majority of existing capital obligations will be repaid by law by 2030, it is assumed that current CVP water contractors would continue to have the ability to pay at least their current allocated share of existing CVP capital obligations less any aid to irrigation received. Accordingly, payment capacities for each type of beneficiary and the ability of project beneficiaries to collectively pay the costs associated with the NED Plan will increase over time as existing obligations are paid down.

Agricultural, M&I, and hydropower beneficiaries' ability to pay assessments are described below.

**Agricultural Water Supply Beneficiaries** Irrigation contractor ability to pay analyses assess the financial capability of an irrigation district (or contracting entity) to pay for existing or increased Reclamation water charges and services (Reclamation 2004d). An ability to pay analysis is completed following a payment capacity study that evaluates the net farm income generated by a typical agricultural operator (or operators) in the district. Given that there are over 250 current contracting entities that supply water to farmers producing hundreds of commodities within the CVP service area across a large geographic area in California (Shasta County to the north to Kern County to the south), detailed analyses for each contracting entity has not been conducted due to the significant level of effort and associated cost. For this Feasibility Report, an initial ability to pay analysis was performed for representative irrigation contractors located in four regions of the CVP.

Ability to pay is defined as the farm-level payment capacity aggregated to the entire district, less district existing obligations, operations and maintenance costs, power costs, and reserve fund requirements. Non-agricultural revenue sources (e.g., hydropower production) may also be incorporated into the ability to pay analysis.

The estimation of a district's ability to pay begins with a payment capacity analysis. Payment capacity is the estimated residual net farm income of irrigators available for payment of both Federally and non-Federally assessed water costs, after deduction for on-farm production and investment expenses, as well as appropriate allowances for management, equity, and labor. Nonfarm revenues are not included in the payment capacity assessment. To estimate payment capacity, farms that are representative of typical agricultural operations in the district are identified. The number of representative farms selected is subjective, but should adequately capture the different types of operations present in the district and should reflect differences in crops grown, farm sizes, and water sources and costs. Each representative farm is modeled using available crop budget information. The estimated payment capacity for each representative farm is then aggregated to the district level according to the proportion of the district's total acreage or total water deliveries associated with each farm type.

For the SLWRI, an initial ability to pay analysis for potential agricultural water supply beneficiaries was developed in 2011 for four regions of the CVP corresponding to four representative contractors. Table 6-4 displays the representative ability to pay per acre-foot results for agricultural water supply beneficiaries in each region (Reclamation 2011f).

**Table 6-4. Ability to Pay Results for Four Representative CVP Agricultural Contractors**

| | Friant/ San Joaquin River | Sacramento River | South of Delta | Northern Sacramento |
|---|---|---|---|---|
| Ability to Pay ($[1,2]/acre-foot) | $7.50 | $324.55 | $150.59 | $97.40 |

*Source: Reclamation 2011f*

Notes:

[1] Dollar values presented at 2011 price level.

[2] Estimated ability to pay values are net of current CVP capital and operations and maintenance obligations.

Key:
CVP = Central Valley Project
Delta = Sacramento-San Joaquin Delta

For this study, financial feasibility is determined by comparing the representative CVP agricultural contractors' ability to pay with the allocated construction costs, IDC, and O&M costs of the NED Plan. Table 6-5

summarizes the allocated irrigation water supply costs for the NED Plan as follows:

- Construction costs allocated to the irrigation water supply purpose (shown in Tables 6-2 and 6-3) are estimated to be $103.8 million.
- Annual irrigation water supply repayment cost is then calculated for a 40-year repayment period with no interest, which equals $2.6 million per year.
- Annual irrigation water supply O&M (non-pumping) costs associated with the new supplies are calculated as the sum of separable and joint non-pumping costs, which equals $0.2 million.
- Additional CVP annual pumping costs associated with the new supplies and assigned to irrigation are estimated to be $0.7 million based on LongTermGen (LTGen) power modeling documented in the Modeling Appendix.

**Table 6-5. NED Plan Allocated Irrigation Water Supply Costs ($ million)**

| Cost Type | Cost ($ million) |
|---|---|
| **Total Construction Cost[1]** | **$103.8** |
| **Annualized Costs** | |
| Irrigation Water Supply Repayment Cost (40-year repayment with no interest) | $2.6 |
| Operations and Maintenance | $0.2 |
| Central Valley Project Additional Pumping Cost | $0.7 |
| **Total Annual Irrigation Water Supply Cost[1] (40-Year Repayment)** | **$3.4** |

Note:
[1] Project features and costs are described in detail in the Engineering Summary Appendix. Costs are presented in millions at a January 2014 price level.
Key:
NED = National Economic Development

Financial feasibility for agricultural water supply was evaluated by comparing the representative beneficiaries' ability to pay with potential irrigation water costs developed with two scenarios. Scenario 1 is based on the assumption that the increment of irrigation water supply and costs from the NED Plan are fully integrated into the CVP to meet existing contracts. The CVP Irrigation Ratesetting Policy (Reclamation 1988) would be used to recover O&M costs and provide repayment of construction costs through water service contracts with all irrigation contractors. Scenario 2 assumes the increment of agricultural water supply from the representative plan would require new repayment contracts with existing CVP and SWP contractors who are willing and able to pay the incremental costs to receive the incremental benefits. For both scenarios, the costs of the NED Plan would be repaid over a 40-year period.

An increase in the annual capital cost of irrigation water supply of $2.6 million would be allocated to CVP agricultural water supply contractors for repayment (Table 6-5). To derive the increase in the cost of water using Scenario 1, the total annual irrigation water supply cost $3.4 million is divided by the 5-year average of total annual CVP water deliveries, 2.2 million acre-feet (Reclamation 2011d). This results in a marginal increase of irrigation water of $1.56 per acre-foot ($1.18 for repayment and $0.38 for other annualized costs). This marginal increase would fall within the ability to pay for each of the four representative contractors described in Table 6-5.

For Scenario 2, financial feasibility was also assessed by comparing only the beneficiaries' ability to pay the annualized costs. At present, the specific agricultural contractors considered to be beneficiaries have not been identified. If new contracts were established, the $3.4 million in allocated irrigation water supply costs would be distributed over the average annual estimated increase of 31,400 acre-feet of agricultural deliveries under the NED Plan. The resulting cost per acre-foot is estimated at $110 for CVP agricultural water supply contractors ($83 for repayment and $27 for other annualized costs). Specific analysis for any contractor would be conducted to provide a determination of financial feasibility and would consider the 2030 deadline for repayment of current CVP capital costs, per Public Law 99-546.

*Status of Existing CVP Irrigation Costs Repayment Status and Ability to Pay Trends* Reclamation provides relief from CVP capital repayment and CVPIA Restoration Fund charges to contractors who are determined to be eligible for aid to irrigation based on a comprehensive ability to pay study. Table 6-6, below, provides a summary of historic and projected repayment of CVP construction costs allocated to irrigation for existing facilities.

Historically, a number of the contractors located north of the Delta that would benefit from the NED Plan have received "aid to irrigation."[2] However, the number of irrigation districts located north of the Delta receiving "aid to irrigation" has been declining in recent years. For example, eight CVP contractors located on the Tehama-Colusa Canal that had been receiving aid to irrigation since the mid-1990s were no longer eligible for the program in 2012 (Reclamation 2014c) due to improved financial circumstances. This trend may be attributed to increased prices and yields for crops, such as rice, which are commonly irrigated in the region. In addition, there has been a trend toward increased permanent crop plantings in Tehama and Colusa counties, which typically generate positive returns. For example, acres planted to almonds in Colusa County increased from 23,240 in 2003 to 45,335 in 2012 (U.S. Department of Agriculture 2014). Similarly, walnut acres have nearly doubled in the two counties over the same time period.

[2] South of Delta contractors currently receiving aid to irrigation would not receive additional surface water from SLWRI alternatives directly.

**Table 6-6. CVP Irrigation Construction Cost Repayment Status as of End of Fiscal Year 2012**

| Allocated CVP Construction Cost and Repayment Item | CVP Costs and Repayment ($ million) |
|---|---|
| **Existing CVP Facility Construction Costs Allocated to Irrigation** | **$1,871** |
| **Repayments of Irrigation Costs** | |
| Irrigation Districts Repayment | $730 |
| Other Repayments Realized[1] | $73 |
| Credits[2] | $17 |
| **Total Repayments of Irrigation Costs** | **$820** |
| **Anticipated Future Repayment of Irrigation Costs** | |
| Repayment of Costs by Irrigation Districts | $829 |
| Repayment of Costs by Irrigation Assistance[3] | $47 |
| Other[4] Anticipated Future Repayment | $175 |
| **Total Anticipated Future Repayments of Irrigation Costs** | **$1,051** |

*Source: United States Government Accountability Office. 2014. Repayment of Water Project Construction Costs. GAO-14-764. September.*

Notes:

[1] Other repayments realized include contributions and revenues that Reclamation calls "incidental revenues," such as excess water sold to irrigation districts or revenue from land leased for grazing.

[2] Credits relieve water users from a portion of their allocated repayment obligations. Types of credits include Congressionally authorized repayment reductions and construction expenses determined to be nonreimbursable.

[3] Irrigation assistance is the amount of construction costs allocated to irrigation that the Secretary of the Interior determines that irrigation districts are unable to pay for a given project, which is repaid from other revenue sources, where available.

[4] Other anticipated future repayment includes repayment anticipated through future repayment contracts and contracts that have been deferred, among other things.

Key:

CVP = Central Valley Project

Section 105 of Public Law 99-546 provided for adjustments in CVP water contracts in order to recover the existing Federal investment by 2030. If the NED Plan was authorized, and implementation and construction proceeded as planned, an enlarged Shasta Dam and Reservoir would be completed in 2025. Assuming that in 2025 CVP water contractors are on track with Public Law 99-546 requirements, if the remaining costs for existing CVP facilities (see Table 6-6) were integrated with costs allocated to irrigation for the NED Plan (see Table 6-5) and repayment occurred over a 40-year period, the resulting annual repayment obligations would be approximately 20 percent of existing obligations. Accordingly, if in 2025 existing costs were integrated with new costs for the NED Plan, agricultural water contractors would have a substantially increased ability to repay obligations.

*Summary* Based on the initial ability to pay analysis performed for representative CVP irrigation contractors, in relation to the repayment scenarios analyzed, and considering repayment of existing CVP facility capital costs by 2030, CVP irrigation contractors that would receive water supply benefits from the NED Plan would likely be able to repay the allocated project costs once the

project is constructed. Further, increasing crop prices and yields and transition to more valuable permanent crops indicate that the ability to pay is increasing for irrigation districts with the potential to benefit from the NED Plan.

**Municipal and Industrial Beneficiaries** Financial feasibility must also address the affordability of water supply for M&I users. The financial feasibility analysis for M&I users assesses how much water users can afford to pay for water supply improvements (i.e., payment capacity) and provides the basis to determine if their payment capacity is sufficient to pay for the allocated project costs (Reclamation 2009). There are a number of accepted methods to estimate payment capacity for municipal water supplies. In general, two approaches are commonly applied. The first applies the use of an "affordability threshold" which is applied relative to median household income in the region. Under this approach, the threshold is applied to median household income for all households within the water service area to arrive at the total payment capacity. Another approach that can be applied to estimate M&I payment capacity is to assess actual water payments relative to net household income for households in the region that will not benefit from the project. The resulting ratios can be used to approximate payment capacity for the households that will benefit from the project. The payment capability ratios represent the proportion of discretionary income that households served by various utilities must spend for domestic water supplies. Therefore, they are a measure of dollars spent on water service per dollar of discretionary household income. This methodology provides an estimate of ability to pay that accounts for variation in household income, household expenses, and costs of living that are not considered when using set percentages of household income (Piper and Martin 1999). Each of these approaches will generally produce similar results and are dependent on the selection of affordability threshold percentage.

For potential municipal water supply beneficiaries of the NED Plan, ability to pay and payment capacity of potential beneficiaries is estimated with an "affordability threshold" represented as a percent of median household income. This analysis applies the affordability threshold established by the EPA. In 1980, the EPA Office of Drinking Water completed a study to assess the costs of complying with new drinking water regulations. The study determined that costs of water service exceeding 2.5 percent of household income were not affordable (EPA 1980). A range of affordability thresholds from other water system analyses were also considered in this analysis, but were not applied because they lacked regional relevance to the study area.

The NED Plan could provide water supply benefits to a range of CVP and SWP M&I water contractors. As a result, this generalized payment capacity analysis is based on a range of representative SWP M&I contractors that could receive project water supplies; therefore, representative regional data was used rather than data specific to individual water agencies. Population data for areas served by 10 potential SWP M&I water supply beneficiaries were obtained from 2010 urban water management plans. The number of households was estimated with

U.S. Census Bureau data (U.S. Census Bureau 2013) by dividing the population estimates by the median household size for the county that comprises the majority of each water agency's service area. Similarly, median household income levels were obtained from county-level data for the county that comprises the largest portion of each water service provider's service area.

In this analysis, the projected number of households in 2030 within each water service area is used to estimate payment capacity for each water service area individually. Table 6-7 provides the average payment capacity analysis results for the 10 representative SWP M&I contractors. As described above, payment capacity is estimated as 2.5 percent of median household income. To account for existing water payments, an estimate of current water rates for Southern California residential customers (obtained from Raftelis Financial Consultants, Inc. and American Water Works Association 2011) is subtracted from the gross payment capacity estimate to arrive at the estimated residual payment capacity that are available to support new water projects. As shown in Table 6-7, the estimated annual average total payment capacity of representative M&I contractors is approximately $700 million. Total estimated annual payment capacity of representative M&I beneficiaries is approximately $6.9 billion.

**Table 6-7. Average Payment Capacity Results for Representative Municipal and Industrial Contractors**

| Average Estimated Households in 2030 | Average Median Household Income ($[1]/hhld/yr) | Average Estimated Current Water Rates ($[1]/hhld/yr) | Average Household Payment Capacity ($[1]/hhld/yr) | Average Estimated Total Payment Capacity ($ million[1]/yr) |
|---|---|---|---|---|
| 826,300 | $62,600 | $656 | $909 | $703.2 |

Note:
[1] January 2014 price level
Key:
hhld = household
yr = year

Financial feasibility for M&I users is determined by comparing the beneficiaries' ability to pay with the annualized repayment of construction costs, IDC, and O&M costs of the NED Plan. Table 6-8 summarizes the allocated M&I water supply costs for the NED Plan, which were estimated as follows:

- Construction costs allocated to the M&I water supply purpose (shown in Tables 6-2 and 6-3) are estimated to be $328.9 million.
- Annual M&I water supply repayment cost is then calculated over a 40-year repayment period with 5.357 percent annual interest rate (U.S. Department of Treasury 2013), which equals $20.1 million.

- Annual M&I water supply O&M (non-pumping) costs are calculated as the sum of separable and joint non-pumping costs, which equals $1.0 million.

- Additional SWP annual pumping costs are estimated to be $4.9 million based on SWPPower modeling documented in the Modeling Appendix to the accompanying EIS.

This analysis assumes the increment of M&I water supply from the NED Plan would require repayment contracts with existing CVP and SWP contractors who are willing and able to pay the incremental costs to receive the incremental benefits. In addition to the M&I water supply repayment cost, the analysis assumes the M&I beneficiaries would need the payment capacity for O&M (non-pumping) and pumping costs.

**Table 6-8. NED Plan Allocated Municipal and Industrial Water Supply Costs ($ million)**

| Cost Type | Cost ($ million) |
|---|---|
| **Total Investment Cost[1]** | **$328.9** |
| **Annualized Costs** | |
| M&I Water Supply Repayment Cost (40-year repayment with interest[2]) | $20.1 |
| Operations and Maintenance | $1.0 |
| SWP Additional Pumping Cost | $4.9 |
| **Total[3] Annual M&I Water Supply Cost[1] (40-Year Repayment)** | **$25.9** |

Notes:

[1] Project features and costs are described in detail in the Engineering Summary Appendix. Costs are presented in millions at a January 2014 price level.

[2] 5.357 percent annual interest rate (U.S. Department of Treasury 2013).

[3] All numbers are rounded for display purposes; therefore, line items may not sum to total.

Key:

M&I = municipal and industrial

NED = National Economic Development

SWP = State Water Project

Financial feasibility was determined by comparing the representative M&I beneficiaries' payment capacity with the annualized costs. At present, the specific M&I water supply beneficiaries have not been identified beyond SWP M&I contractors generally. If new contracts are established as part of the NED Plan, the $25.9 million in allocated M&I water supply costs would be spread over an average annual increase of 19,900 acre-feet, and the cost per acre-foot is estimated at $1,304 for M&I water supply beneficiaries ($1,011 for repayment, and $293 for O&M (non-pumping) and pumping costs). The total annual M&I water supply cost ($25.9 million) would be significantly less than the average annual payment capacity for representative M&I contractors ($703.2 million).

The large estimated average annual payment capacity of M&I users (Table 6-7) in comparison to the estimated total annual M&I water supply cost (Table 6-8) indicates that potential M&I contractors that would benefit from the NED Plan will be able to repay the allocated project costs. In addition, expected increases in population and related regional income will increase regional payment capacity and further support potential M&I contractors' ability to pay allocated project costs.

**Hydropower Beneficiaries** Financial feasibility for hydropower beneficiaries addresses the affordability of CVP power in relation to power market rates in the region. CVP power contractors develop electricity generation portfolios to reliably meet their load obligations in a cost-effective manner consistent with local, State, and Federal mandates. Historically, power market rates have exceeded CVP power costs on a long-term average annual basis, and it is expected that CVP power will remain an attractive component of power contractors' electricity generation portfolios with changes in repayment obligations associated with implementing the NED Plan.

Hydropower generated through CVP facilities is first used to meet CVP operation needs or loads, and hydropower generated beyond CVP operational needs is marketed by the Western Area Power Administration (WAPA). WAPA owns and maintains power lines that transmit power from Federal dams in the CVP system to power customers. WAPA collects allocated construction costs and operation, maintenance, and replacement (OM&R) costs, as well as CVPIA Restoration Fund charges from CVP power contractors.

WAPA calculates an annual power revenue requirement (PRR) to recover construction costs, OM&R, interest payments, and requirements for other services and products provided by WAPA. Each power customer is then assigned its percentage share of the annual PRR to generate sufficient revenues to meet the revenue requirement. WAPA reconciles actual and estimated revenue requirements within the fiscal year, and shortfalls or excesses are accounted for in the next year's PRR. As of the end of fiscal year 2009, approximately 75 percent of CVP construction costs allocated to power had been repaid.

In addition to CVP construction costs allocated to hydropower for repayment, CVP power contractors are also obligated to repay construction costs and mitigation charges for agricultural water contractors receiving aid to irrigation relief. As of September 30, 2010, the power contractors' aid to irrigation relief was estimated at over $43 million. Historically, WAPA has not included these costs in the PRR.

Variability in hydrology and a variety of regulatory requirements have impacted water supply deliveries, affecting power contractors' repayment obligations and the price of CVP power. Generally, in dry year conditions, when less water is available for water supply deliveries, less CVPIA Restoration Fund charges are

collected from water supply users, and power contractors are required to pay a larger share of these costs. Conversely, in wet year conditions, when more water is available for water supply deliveries, more CVPIA Restoration Fund charges are collected from water users and power contractors are required to pay a smaller share of these costs.

Table 6-9, below, displays the base rate of CVP power and the percentage increase in rates due to additional CVPIA Restoration Fund charges from 2002 to 2011, and associated power market rates. As shown, the percent of CVPIA Restoration Fund charges to total CVP power costs ranged from 7.6 percent to 34.3 percent and the percent of total CVP power cost to the market rate ranged from 20 percent to 124 percent. Table 6-9 also shows the variability in the power market rate due to other energy sources (e.g. natural gas) and regulatory requirements.

As shown in Figure 6-1, on a long-term average annual basis, the cost of CVP power has been lower than the power market rate, and an attractive component of power contractors' electricity generation portfolios. It should be noted that external factors that impact the power market rate will continue to affect the cost competitiveness of CVP power in the future.

**Table 6-9. CVP Power Rates, Restoration Charges, and Power Market Rates**

| Fiscal Year | Water Year Type | Base Rate for Power ($/MWh) | Additional Restoration Charge ($/MWh) | Restoration Charge Percent of Total CVP Power Cost | Total Cost of CVP Power[1] ($/MWh) | Power Market Rates (NP-15)[2] | Total CVP Power Cost Percent of Market Rate |
|---|---|---|---|---|---|---|---|
| **2002** | Dry | $23.83 | $3.28 | 12.10% | $27.11 | $26.03 | 104% |
| **2003** | Above Normal | $24.63 | $2.02 | 7.60% | $26.65 | $42.24 | 63% |
| **2004** | Below Normal | $24.73 | $0.60 | 2.40% | $25.33 | $45.39 | 56% |
| **2005** | Above Normal | $13.18 | $6.78 | 33.90% | $19.96 | $56.17 | 36% |
| **2006** | Wet | $8.71 | $3.23 | 27.10% | $11.94 | $60.70 | 20% |
| **2007** | Dry | $20.19 | $2.02 | 9.10% | $22.21 | $56.81 | 39% |
| **2008** | Critical | $28.50 | $11.04 | 27.90% | $39.54 | $73.88 | 54% |
| **2009** | Dry | $29.89 | $15.65 | 34.30% | $45.54 | $36.81 | 124% |
| **2010** | Below Normal | $31.76 | $5.29 | 14.30% | $37.05 | $38.19 | 97% |
| **2011** | Wet | $21.24 | $7.77 | 26.80% | $29.01 | $39.09 | 74% |

*Source: Western Area Power Administration Rates Department, March 2011*
Notes:
[1] Does not include additional aid to irrigation costs.
[2] Power market rates are estimated at North Path-15, a delivery point and energy trading hub for California Independent System Operator.
Key:
MWh = Megawatt-hour
NP-15 = North Path-15

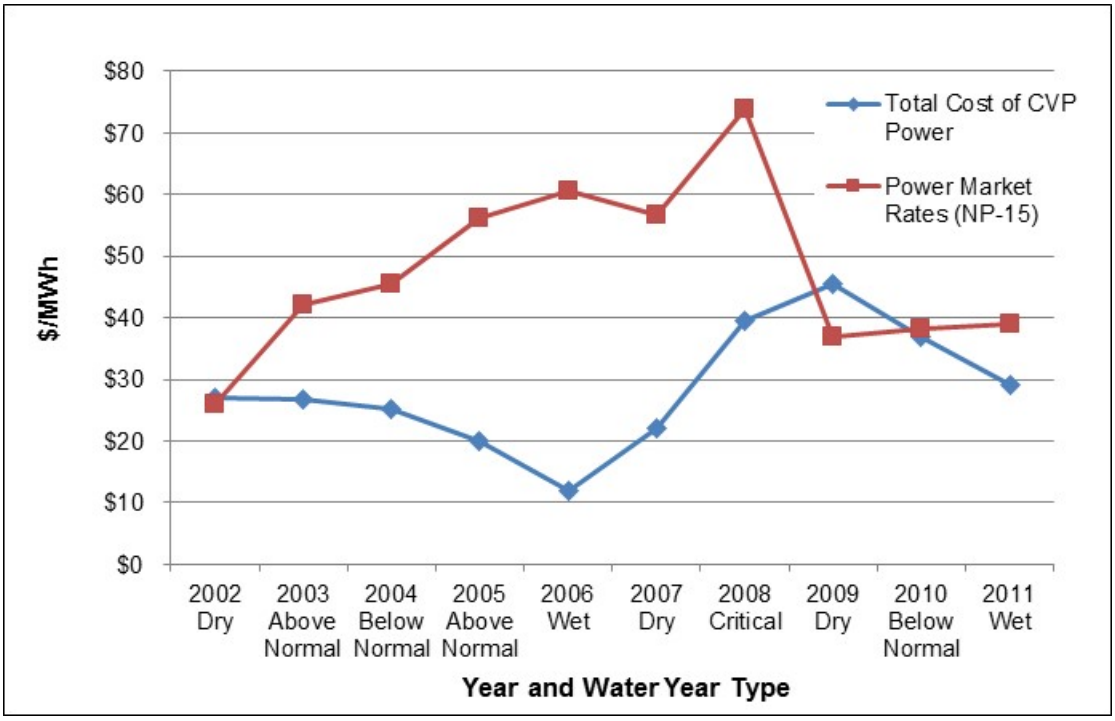


**Figure 6-1. Cost of CVP Power in Relation to Power Market Rate**

Forecasting CVP and market-based energy prices on a long-term basis is difficult due to the high degree of uncertainty associated with energy markets and hydrologic conditions. However, it is still possible to develop a cost comparison analysis evaluating the relative cost competitiveness of CVP hydropower resources against forecasted power market rates. Reclamation worked with WAPA to develop analyses based on regional power rate projections estimated for three potential future hydrology and power generation scenarios. As described in the "Payment Capacity of Hydropower Beneficiaries" Attachment to the Cost Allocation Appendix, results of these analyses indicate that power market rates will continue to exceed CVP hydropower costs on a long-term average annual basis, and CVP power costs will not exceed alternative costs of power for prolonged periods of time.

It is anticipated that changes in power repayment obligations associated with implementing the NED Plan would not significantly affect the price competitiveness of CVP power in relation to regional power market rates. Repayment of existing CVP facility capital obligations by law by 2030 will reduce existing power cost recovery obligations and CVP power is anticipated to remain an attractive component of power contractors' electricity generation portfolios. In the interim period between completion of construction of the NED Plan and repayment of existing CVP facility capital costs (2025 to 2030), CVP power price competitiveness could be impacted, depending on hydrology and regulatory requirements, though long-term average annual CVP power costs would likely remain lower than the power market rate.

# Risk and Uncertainty

Certain assumptions were made for aspects of the feasibility study based on engineering, economic, and scientific judgment. Careful consideration was given to the methodologies and evaluations for hydrology and system operations, cost estimates, and biological analyses, as described in the Modeling Appendix and Engineering Summary Appendix to the accompanying EIS. Analyses were developed with advanced modeling and estimating tools using historical data and trends. While this is effective in helping predict outcomes for future operations, benefits, costs, and biological conditions, many uncertainties could affect the findings of this Feasibility Report. Various risks and uncertainties associated with the SLWRI and potential modification of Shasta Dam are discussed below.

## Hydrology and Climate Change

Potential climate change could produce conditions that differ from today. The potential for, and magnitude of, climate change is widely debated. The State is investing significant resources to study how global climate changes could affect the way hydrology in California is affected. Results indicate that climate changes in the State could affect rainfall, snowfall, temperature, water temperature, and future water project operations for both flood management and water supply deliveries.

California could experience changes in temperature, precipitation, and snow level (DWR 2014b). Any measurable change in these climate indicators could affect future water operations in California. It is unlikely that changes in snow levels would significantly affect Shasta Reservoir because the reservoir is primarily filled by direct rainfall runoff, as opposed to snowmelt. However, changes in water management operations downstream and in the Delta could affect Shasta Reservoir operations. If precipitation increases, it may further enhance the benefits of increased reservoir capacity. According to the *California Water Plan Update 2013* (DWR 2014b), more studies are needed:

> *Uncertainties will never be eliminated, but better data and improved analytical tools will allow water and resource managers to better understand risks within the system. Many water agencies in California have begun incorporating climate change information into their operation and planning processes to reduce uncertainty of how climate may affect California's water resources in the future. Additional efforts are needed to develop the accurate climate data needed to reduce uncertainty and risk in California water management in the future.*

The Climate Change Modeling Appendix to the accompanying EIS contains additional information on the implications of climate change for California water resources. In addition, the Climate Change Modeling Appendix documents a sensitivity analysis of the potential for the alternative that

maximized increased water supply reliability (CP5) to address primary project objectives under climate change. The Climate Change Modeling Appendix also provides a similar analysis for the alternative that maximizes increased anadromous fish survival (CP4). Although all alternatives were not directly evaluated, it is anticipated that the trends related to climate change for water supply and anadromous fish would be similar. As described in Chapter 4, these evaluations indicate that the comprehensive plans are robust and would provide benefits under a range of future climate scenarios.

## Water Supply Reliability and Demands

Water supplies and demand will continue to vary annually. Demands are expected to exceed supplies in the future, but predicting the absolute value of future water supplies and/or shortages in the Central Valley of California is not possible. Such predictions would depend upon numerous variables with differing opinions regarding each variable. For example, there are many opinions regarding population growth. The *California Water Plan Update 2013* (DWR 2014b) estimates demand for different growth scenarios, ranging from "lower than current trends," which assumes that population growth will be slower than currently projected," to "higher than current trends," which assumes that population growth will be faster than currently projected, with nearly 70 million people living in California in 2050.

Potential circumstances that would result in an overall reduction in future demands for agricultural water supplies include land conversion from agricultural to urban land uses and improved efficiency for irrigation water applications.

### *Future Land Use*

Population growth is a major factor in California's future water use and management. California's population is expected to increase by just over 60 percent relative to 2005 levels by 2050 (California Department of Finance 2007). Water supplies for the larger population could come from a conversion of agricultural supplies, efficiency measures, reuse, and/or recycling. Some portion of increased population growth in the Central Valley would occur on lands currently used for irrigated agriculture. Therefore, water that would have been needed for these lands for irrigation would instead be used to serve urban demands. However, this would only partially offset the required agricultural-to-urban water conversion, since growth would also occur on nonirrigated agricultural lands. If it was assumed that all of the urban growth in the Central Valley would occur on lands currently under irrigation, this would only account for up to about 40 percent of the expected future increase in water supply needs. The remainder of the agricultural-to-urban water conversion to help sustain urban growth would be located primarily in other areas of the State.

### *Agricultural Water Use Efficiency*

Agricultural interests are continually improving irrigation efficiencies, including use of irrigation technology. Users who have already increased efficiency may

find it more challenging to achieve additional water use reductions during droughts. This hardening of demands and associated water availability during droughts is likely to influence planting decisions related to crop types. The type of crops grown heavily influences potential for improved agricultural water use efficiency. For example, more advanced irrigation technology is typically used for permanent crop types. Potential future changes in cropping patterns and related irrigation efficiency will heavily influence agricultural water demands.

## Anadromous Fish Populations

Anadromous fish are highly affected by changes in their surrounding conditions; therefore, predicting fish production is difficult because of the many influencing factors. The SALMOD model used to estimate Chinook salmon production for this Feasibility Report contains assumptions with varying levels of uncertainty. A key uncertainty stems from using the same number of spawners in each year of the SALMOD simulation. That is, any increase or decrease in production at the end of a cohort year is not carried forward into another set of spawners. This is because SALMOD is not a life-cycle model, and only takes into account the environmental and biological factors that affect survival of Chinook salmon between Keswick Dam and RBPP. For the SLWRI, SALMOD is not used as a population dynamics model or a predictive tool for explicit population estimation; rather it is used as an operation screening tool, or a comparative tool to evaluate relative change between alternatives. This allowed Reclamation, under each year, to evaluate what would happen to each run of Chinook salmon under the specific water operations Because each alternative starts each year with the same number of spawners, when used comparatively, the effects on each run of Chinook salmon become clear and easy to evaluate. Additionally, the use of SALMOD allows the focus of impacts to be where the greatest direct effects of the project occur – that is, the Sacramento River upstream from RBPP.

Although all models are subject to uncertainty, SALMOD was chosen as the best available model for performing population comparisons on the Sacramento River for multiple reasons. First, it is the best available model that calculates survival and mortality to all four runs of Chinook salmon resulting from changes in both water temperature and flow. Second, SALMOD has been applied previously on the Sacramento River (Kent 1999, Bartholow 2003, Reclamation 2008a). The U.S. Geological Survey (USGS) completed a thorough review and update of model parameters and techniques on the Klamath River and reviewed Sacramento River-specific Chinook salmon information obtained from USFWS and CDFW fisheries biologists, enabling a smooth transfer of relevant model parameters to Sacramento River modeling for the SLWRI (Bartholow and Henriksen 2006). SALMOD was peer reviewed by Thompson and Mosser (2011). Finally, SALMOD was approved for use in several other Federal-level studies, including the Reclamation's 2008 Long-Term Operation BA for compliance with Section 7 of the ESA (Reclamation 2008a) and resulting NMFS 2009 BO (NMFS 2009a).

Independent of the SALMOD model, uncertainty in anadromous fish survival is also related to water conditions outside the area of influence of the dam raise, including the Sacramento River downstream from RBPP, the Delta, and the Pacific Ocean. Potential climate change could also influence fish survival.

The 2009 NMFS BO (NMFS 2009a) RPA as well as the 2014 Recovery Plan for Chinook salmon and steelhead (NMFS 2014) identified actions that, if implemented, could lead to improved conditions for Chinook salmon, steelhead and green sturgeon. Most of the actions, including fish passage above Shasta Dam and floodplain habitat restoration projects downstream from RBPP, could provide additional benefits to the Sacramento River anadromous fish populations. However, there is uncertainty as to the level of benefit (e.g., number of fish produced) or even the potential success (e.g., feasibility of fish passage) of the programs identified in both the BO and the Recovery Plan, as well as other restoration programs in the planning stages.

#### *Adaptive Management*

Adaptive management of system operations could reduce uncertainty in anadromous fish survival. Adaptive management is a deliberate, iterative, and scientific process of designing, implementing, monitoring, and adjusting an action, measure, or project to reduce uncertainty and maximize one or more goals over time. If applied appropriately, this approach would allow for flexible operations based on best available science and new information as it becomes available. For this project, an adaptive management plan may include operational changes to the timing and magnitude of releases from Shasta Dam primarily to improve the quality and quantity of aquatic habitat. These changes could include increasing minimum flows, timing releases from Shasta Dam to mimic more natural seasonal flows, meeting flow targets for side channels, or retaining additional storage to meet temperature requirements to improve conditions supporting anadromous fish survival.

## Water System Operations Analysis

Predictions of future water system operations depend on assumptions about future facilities, operational constraints, hydrology, and changes in Delta exports based on Federal regulations, including the ongoing remand process and planning policies that are subject to change. As described in Chapter 1, Section "Related Studies, Projects, and Programs," operational constraints for the CVP and SWP are affected by changing regulatory conditions in California. For this Feasibility Report, CVP and SWP operational assumptions were based on operations described in Reclamation's 2008 Long-Term Operation BA, the 2008 USFWS BO, the 2009 NMFS BO, and the Coordinated Operations Agreement between Reclamation and DWR, as ratified by Congress. These assumptions were used to guide refinement, modeling, and evaluation of alternatives and were used as the basis of analysis in this Final Feasibility Report. The ongoing consultation processes for the 2008 USFWS and 2009 NMFS BOs have resulted in some uncertainty in future CVP and SWP operational constraints. However, the 2008 Long-Term Operation BA and the

2008 and 2009 BOs issued by the fishery agencies contain the most recent estimate of potential changes in water operations that could occur in the near future. However, these legal challenges may result in changes to CVP and SWP operational constraints if the revised USFWS and NMFS BOs contain new or amended RPAs.

In addition, potential implementation of an alternative under the BDCP could affect the estimated benefits of SLWRI comprehensive plans. The discussion below describes the nature of potential effects.

***Analysis of Potential BDCP Alternatives***

The BDCP is being prepared collaboratively by Federal, State, and local agencies, environmental organizations, and other interested parties. The BDCP is intended as a comprehensive conservation strategy for the Delta, designed to advance the coequal planning goals of restoring ecological functions of the Delta and improving water supply reliability for large portions of the State of California.

A range of alternatives for providing Delta species/habitat protection and improving water supply reliability is being evaluated through development of an EIS/EIR. The current CEQA Preferred Alternative outlined in the BDCP Draft EIS/EIR includes a dual-conveyance water delivery system that would consist of new isolated north Delta diversion facilities and the existing SWP/CVP export facilities in the south Delta (Reclamation, USFWS, NMFS, and DWR 2013). The north Delta diversion would be the primary diversion point and would be operated in conjunction with the existing south Delta diversion; the existing south Delta diversion would only operate on its own when the north Delta diversion is nonoperational during infrequent periods for maintenance or repair. Facilities associated with the new north Delta diversion described under the current CEQA Preferred Alternative, Conservation Measure 1 – Water Facilities and Operation, include the following (Reclamation, USFWS, NMFS, and DWR 2013):

- Three new intakes located along the Sacramento River, each with an intake capacity of 3,000 cfs
- An intermediate forebay located near the town of Hood
- A dual-bore 40-foot-inside-diameter tunnel with conveyance capacity of 9,000 cfs by gravity flow from the location of the new intermediate forebay to Clifton Court Forebay

The following discussion describes how implementation of the BDCP could affect the existing system, and how the estimated benefits of SLWRI comprehensive plans could change if a BDCP alternative was implemented.

**Anadromous Fish Survival** All SLWRI comprehensive plans were formulated specifically to benefit anadromous fish in the upper Sacramento River, with a specific focus on increasing outmigration of salmonids downstream from RBPP. The BDCP is anticipated to improve habitat conditions in the Delta for anadromous fish species and increase the survival of outmigrating salmonids in the Delta. Improved habitat conditions in the Delta through implementation of any BDCP alternative are anticipated to further increase the survival in the Delta of outmigrating salmonids resulting from an enlarged Shasta Dam and Reservoir. However, there is significant uncertainty related to the magnitude of these benefits.

**Water Supply Reliability** All SLWRI comprehensive plans were formulated specifically to increase CVP and SWP water deliveries and water supply reliability. Isolated north Delta diversion facilities implemented as part of the BDCP could increase water deliveries to CVP and SWP SOD water users and improve water quality for urban and agricultural water users. Implementation of an enlarged Shasta Dam and Reservoir in combination with any BDCP alternative would likely provide greater water supply benefits than implementing either proposed project independently. Modifications of Shasta Dam and Reservoir could increase system flexibility and potential use of new Delta conveyance facilities, providing for even greater water supply reliability. However, the magnitude of the combined benefits is dependent upon type and size of conveyance facilities included in BDCP alternatives.

**Secondary Planning Objectives** SLWRI benefits for ecosystem restoration, hydropower generation, flood damage reduction, recreation and water quality could also be affected for comprehensive plans if BDCP is implemented. Increases in water supply reliability due to increased system flexibility and potential use of new Delta conveyance facilities could change average water levels in Shasta Reservoir, potentially affecting benefits to secondary objectives. However, the magnitude and timing of these affects are unknown.

## Cost Estimates

Cost estimates developed for comprehensive plans included in this report are based on January 2014 price levels and a 100-year period of analysis. All cost estimates, even at a feasibility-level, have inherent risks and uncertainties, including labor costs, materials availability, competitive bidding environments, unidentified field conditions, financial and/or commodity market conditions, and changing regulatory environments.

Of primary consideration, varying uncertainties are associated with the material and unit costs used to develop the estimates. Unknowns include the price of construction materials and labor costs. In particular, the construction market has experienced extreme price volatility in the last several years. A significant market anomaly occurring from 2002 to 2009 skews the calculation of forward cost trends using short-term linear regression techniques.

Although the recent economic downturn has resulted in price decreases, it is expected that prices will continue to escalate over the long term. While future inflation trends are difficult to predict, new market forces (e.g., higher material commodity pricing, energy costs, lack of competition) will likely continue to have significant impacts on heavy civil infrastructure construction costs for the foreseeable future. Because of uncertainty and variability among the short-term regressions, a longer view of the market is preferred. Consequently, while forward cost trends are always difficult to predict, there is some basis to believe that cost escalation is normalizing back to historical levels at approximately 3 percent per year.

To better understand how uncertainties in quantities and unit pricing may affect project costs, a Monte Carlo simulation and risk analysis was conducted for CP4A using Oracle Crystal Ball software. Based on this Monte Carlo simulation at 10 percent and 90 percent, the total construction cost of CP4A ranges from $1,240 million to $1,399 million, respectively. Specifically, the 90 percent estimate has a 90 percent probability that the actual construction cost will not exceed $1,399 million. The feasibility-level estimate for total construction cost of CP4A is $1,265 million and falls within the range of the confidence interval of the crystal ball risk analysis.

## Construction Schedule and Funding

The construction schedule and associated costs for the NED Plan are based on receiving appropriations consistent with the schedule. Partial or no appropriations would likely extend the construction schedule. This would likely result in increased costs, both construction field costs and non-contracts costs. As described in the Engineering Summary Appendix to the accompanying Final EIS, there may be potential to accelerate the construction schedule. The current schedule estimates about a 5-year construction period. However, this 5 year period could potentially be substantially reduced through measures such as optimizing contract packaging, selective use of design-build for certain facilities, and requiring shorter, more aggressive contract durations employing multiple shift work. Implementing measures to accelerate the schedule could potentially reduce schedule risk, raising the confidence in the overall 5 year construction period.

## Monetizing Project Benefits

Estimating economic (monetized) benefits of potential project accomplishments is critical to establishing economic feasibility and identifying a corresponding NED plan. For each comprehensive plan, monetized benefits were estimated for increased agricultural water supply reliability, M&I water supply reliability, anadromous fish survival, hydropower, and recreation. Valuation methods for each NED benefit category are presented in the Economic Valuation Appendix and summarized in Chapter 5. As described, varying uncertainties are associated with each valuation method.

To address the risk and uncertainty related to valuation of benefits, alternate valuation methods are presented in the Economic Valuation Appendix for each benefit category as a sensitivity analysis. Table 6-10 below summarizes results of the NED and sensitivity evaluations for the NED Plan, CP4A. As shown in Table 6-10, sensitivity analysis estimates were generally higher than NED estimates for all benefit categories except M&I water supply, which is lower because a substantial portion of the M&I deliveries under comprehensive plans are excluded in LCPSIM due to model limitations. Sensitivity analysis estimates for agricultural water supply, anadromous fish, and hydropower are substantially higher than NED benefit estimates. Resulting total economic benefits and benefit/cost ratio for the sensitivity analysis of CP4A are approximately four times higher than the NED benefit estimates.

**Table 6-10. Sensitivity Analysis Comparison of Annual Benefits for CP4A ($ millions/year)[1]**

| | Agricultural Water Supply Reliability[2] | M&I Water Supply Reliability[3] | Anadromous Fish Survival[4] | Hydropower[5] | Recreation[6] | Total | B/C Ratio |
|---|---|---|---|---|---|---|---|
| **NED Benefit Estimate** | 5.1 | 21.8 | 33.3 | 14.4 | 14.3 | 88.9 | 1.51 |
| **Sensitivity Analysis** | 10.0 | 10.6 | 276.3 | 26.7 | 15.0 | 338.6 | 5.74 |

Notes:

[1] Dollar values are expressed in January 2014 price levels.

[2] NED benefits estimated using the SWAP model. Sensitivity analysis benefits estimated using a statistical model of California spot market water transfer activity.

[3] NED benefits estimated using the M&I Water Transfer Pricing Model. Sensitivity analysis benefits estimated using LCPSIM. Benefits estimated using LCPSIM are lower because model limitations in LCPSIM exclude a substantial portion of the M&I deliveries under CP4A.

[4] NED benefits estimated based on the least-cost alternative approach. Sensitivity analysis benefits estimated using results of 2012 annual household willingness to pay surveys for the Klamath River Basin Restoration investigation.

[5] NED benefits estimated based on increased energy generation, ancillary services benefits, and capacity benefits. Sensitivity analysis benefits include increase of hydropower costs at 2 percent above inflation to account for growing scarcity in the future.

[6] NED benefits estimated based on lower bound predicted changes in annual recreation visitation. Sensitivity analysis benefits based on upper bound predicted changes in annual recreation visitation.

Key: B/C = Benefit/Cost
CP= Comprehensive Plan
LCPSIM = Least Cost Planning Simulation Model
M&I = municipal and industrial
NED = National Economic Development
SWAP = Statewide Agricultural Production

# Unresolved Issues

The following subject areas are issues that Reclamation will continue to address if a project is authorized for implementation. In addition, Chapter 1 of the Final EIS contains additional discussion related to areas of controversy.

## Non-Federal Cost-share Partners

Agreements with project participants must be negotiated that address an up-front cost share, consistent with the beneficiary pays principle. A final recommendation cannot be made until such a cost share agreement is addressed.

## Native American and Cultural Resources

Numerous cultural resources would be significantly affected by all of the action alternatives. Reclamation has invited Federally recognized tribes and non-Federally recognized tribal groups to be consulting parties to the National Historic Preservation Act Section 106 process. No Federally recognized tribes

reside in the immediate Shasta Lake area. However, the Winnemem Wintu (a Native American group) continue to raise concerns about impacts of the original construction of Shasta Dam and potential impacts of enlarging Shasta Dam on sites they value for historical and cultural significance. The Winnemem Wintu would continue to have the opportunity to participate, and are anticipated to continue to provide input as an invited consulting party, through the Section 106 process.

## Implementation Requirements

After this Final Feasibility Report is completed, a number of requirements will remain before a project can be implemented. These requirements are described below.

### *Agreement on Up-Front Cost-Share with Project Participants*

A cost-share agreement addressing an up-front cost share must be negotiated prior to any recommendation being made. As noted, current Federal Budget conditions and the impacts those conditions have on Reclamation's budgetary resources significantly constrain Reclamation's ability to fully fund new construction activities of the scope and magnitude required by the SLWRI. As a result, the traditional model under Federal reclamation law, with Congress providing funding from annual appropriations to cover all the costs of construction over a relatively short period of time, and a portion of those funds being repaid to the Treasury over 40 – 50 years, is unrealistic for the identified SLWRI NED Plan. Alternative means of financing (primarily non- Federal) for a majority of the construction costs of the NED Plan would have to be identified and secured in order for the Secretary of the Interior to be able to recommend a construction authorization to Congress.

### *Project Authorization*

The proposed project, in light of any potential agreement on up-front cost-share as discussed above, would then be considered for authorization by Congress. Congress may (1) approve the NED Plan or any other plan, with or without further modification; (2) decide not to approve any action alternative; or (3) request additional information from the Secretary. If authorized, Congress may provide further direction through legislation and provide appropriations to implement the authorized project.

### *Project Funding/Appropriations*

If authorized, a separate appropriation authorization would be required. Unless otherwise established by law, funding for construction of an authorized project is typically included in the President's budget based on (1) national priorities, (2) magnitude of the Federal commitment, (3) level of local support, (4) willingness of the non-Federal sponsor to fund its share of the project costs, and (5) budgetary constraints that may exist at the time of construction. The source, availability, appropriation process, and timing may affect the estimated

construction schedule included in this Final Feasibility Report, Final EIS and supporting documents.

***Regulatory and Related Requirements for Environmental Compliance***

Modifications to Shasta Dam and Reservoir would be subject to the requirements of Federal, State, and local laws, policies, and environmental regulations, as described in this Feasibility Report and accompanying Final EIS and/or as supplemented or modified by authorizing legislation. Reclamation or a CEQA lead agency, assuming one is identified in the future, would need to obtain various permits and regulatory authorizations before any project construction could begin. If Congress authorizes and funds construction to enlarge Shasta Dam and Reservoir, then preconstruction activities will be conducted to refine the designs and costs of project features and mitigation commitments, finalize implementation responsibilities, and complete supplemental documentation before preparing and submitting various permit applications to regulatory agencies for approval. Table 6-11 identifies the likely permits, responsible agencies, and their responsibilities that are required before the start of any physical project implementation activities. After the approval of all required permits, and/or waivers as may be appropriate, then the implementation of mitigation measures may proceed before, or consistent with other physical features, in compliance with NEPA and standard Federal practices.

***Advanced Planning and Design Activities***

If Congress authorizes and appropriates funds for construction of a project to enlarge Shasta Dam and Reservoir, then Reclamation would initiate activities in coordination with project partners and stakeholders to conduct and complete required advanced planning and design activities before implementation of the project. Several key activities include: (1) developing a post-authorization report to present the results of subsequent advanced planning actions, refinement of designs, cost estimates, updated analyses of potential effects and economics, and related NEPA and/or CEQA analyses and documentation, if necessary; (2) preparing detailed plans, specifications, and bid packages; (3) establishing agreements for reimbursable project purposes; (4) developing and/or revising operations, maintenance, and related plans; and (5) acquiring required lands, easements, and rights-of-way.

**Table 6-11. Summary of Potential Major Permits and Approvals for Project Implementation**

| Agency Permit/Approval | Recommended Prerequisites for Submittal[1] | Estimated Processing Time[2] | Anticipated Fees |
|---|---|---|---|
| **Federal** | | | |
| **USACE**<br>Clean Water Act Section 404 | • Application<br>• ESA compliance document for submittal to USFWS/NMFS/CDFW<br>• Section 401 Water Quality Certification permit or application<br>• NEPA documentation (environmental compliance documents)<br>• Section 106 compliance documentation<br>• Wetland delineation<br>• Section 404 (b)(1) evaluation and identification of the Least Environmentally Damaging Practical Alternative<br>• Mitigation and monitoring plan | 24 months | $100 for Individual permit |
| **USFWS/NMFS**<br>Endangered Species Act Section 7 Consultation | • Regular informal technical consultation<br>• ESA compliance document<br>• Draft environmental compliance documents | 12 months | None |
| **USFWS/NMFS/CDFW**<br>Fish and Wildlife Coordination Act | • Regular Informal technical consultation<br>• ESA compliance document<br>• Draft environmental compliance documents | 12 months | None |
| **SHPO[3]/ACHP**<br>National Historic Preservation Act, Section 106 | • Historic Property Inventory Report<br>• Native American consultation | 24 months | None |
| **State** – PRC 5093.542 (c) and (d), pertaining to the McCloud River, may limit the ability of State agencies to review and process permits and related approvals for modifications of Shasta Dam and Reservoir. | | | |
| **RWQCB**<br>Clean Water Act Section 401 | • Application<br>• Fish and Game Code Section 1602 application<br>• CWA Section 404 permit or application<br>• Draft environmental compliance documents<br>• Mitigation and monitoring plan (if needed) | 6 months | $500+ |
| **CDFW**<br>California Endangered Species Act Section 2081—Incidental Take Permit<br>or<br>2080.1 Consistency Determination | • Informal technical consultation<br>• Application, if requesting a 2081 Incidental Take Permit<br>• Biological opinion and incidental take statement, if requesting a consistency determination (preferred approach) | 6 months after Biological Opinions issued | None |
| **CDFW**<br>Fish and Game Code Section 1600 Streambed Alteration Agreement | • Application<br>• Section 401 Water Quality Certification permit or application<br>• CWA Section 404 permit or application<br>• Draft environmental compliance documents<br>• Mitigation plan | 9 months | $4,000 |
| **Central Valley Flood Protection Board California Code, Title 23: Encroachment Permit** | • Application | 9 months | None |
| **State Lands Commission Land Use Lease** | • Application<br>• Draft environmental compliance documents | 9 months | $25 |

**Table 6-11. Summary of Potential Major Permits and Approvals for Project Implementation (contd.)**

| Agency Permit /Approval | Recommended Prerequisites for Submittal[1] | Estimated Processing Time[2] | Anticipated Fees |
|---|---|---|---|
| **State of California Department of Transportation** Encroachment Permit | • Application<br>• Permit Engineering Evaluation Report | 60 days | None |
| **Local** | | | |
| **SCAQMD** Authority to Construct and Permit to Operate | • Application<br>• Preapplication meeting (encouraged) | 6 months | $75 |

Notes:
[1] All permit applications require detailed project description information.
[2] Anticipated processing time is estimated based on submittal of initial permit applications to permit issuance.
[3] PRC 5093.542 (c) and (d), pertaining to the McCloud River, may limit the ability of State agencies to review and process permits and related approvals for modifications of Shasta Dam and Reservoir.

Key:
ACHP = Advisory Council on Historic Preservation
CWA = Clean Water Act
CDFW = California Department of Fish and Wildlife
ESA = Endangered Species Act
NEPA = National Environmental Policy Act
NMFS = National Marine Fisheries Service
PRC = Public Resources Code
RWQCB = Regional Water Quality Control Board
SCAQMD = Shasta County Air Quality Management District
SHPO = State Historic Preservation Officer
State = State of California
State Water Board = State Water Resources Control Board
USACE = U.S. Army Corps of Engineers
USFWS = U.S. Fish and Wildlife Service

### *Project Construction and Transfer to O&M Status*

After the feasibility study and resultant decision making, post-authorization environmental compliance, advanced planning and design efforts described above, then project implementation efforts would transition to the preparing and executing construction contracts, starting implementation of mitigation measures and/or construction activities, completing such construction activities, commissioning new facilities, and, finally, operating and establishing and/or transferring O&M responsibilities.

If Congress authorizes and funds construction to enlarge Shasta Dam and Reservoir, then preconstruction activities would be conducted to refine the designs and costs of project features and mitigation commitments, finalize implementation responsibilities, and complete supplemental documentation before preparing and submitting various permit applications to regulatory agencies for approval. After the approval of all required permits, and/or waivers as may be appropriate, then the implementation of mitigation measures may proceed before, or consistent with other physical features, in compliance with NEPA and standard Federal practices.

In addition to the major Federal, State, and local environmental requirements detailed in Table 6-11, the NED Plan may be subject to other laws, policies, or plans. Table 6-12 summarizes other laws, policies, and plans that may potentially affect the implementation of any plan authorized for construction.

**Table 6-12. Summary of Applicable Laws, Policies, Plans, and Permits Potentially Required**

| Level | Laws, Policies, Plans, and Permits |
|---|---|
| Federal | Federal Endangered Species Act |
| | Section 404 of the Clean Water Act |
| | Rivers and Harbors Act Section 10 |
| | National Historic Preservation Act, Section 106 (1966) |
| | Migratory Bird Treaty Act |
| | Fish and Wildlife Coordination Act |
| | Executive Orders 11990 (Wetlands Policy), 11988 (Flood Hazard Policy), and 12898 (Environmental Justice Policy) |
| | Indian Trust Assets |
| | Americans with Disabilities Act |
| | Rehabilitation Act |
| | Farmland Protection Policy |
| | Federal Transit Administration Activities and Programs |
| | Essential Fish Habitat |
| | Architectural Barriers Act |
| | Federal Cave Resources Protection Act (1988) |
| | Executive Order 11312 (National Invasive Species Management Plan) |
| | Magnuson-Stevens Fishery Conservation and Management Act |
| | National Wild and Scenic Rivers System |
| | Federal Land Use Policies |
| | Federal Water Project Recreation Act |
| | Whiskeytown-Shasta-Trinity National Recreation Area Management Guide |
| | Whiskeytown-Shasta-Trinity National Recreation Act |
| | Shasta-Trinity National Forest Management Plan |
| | Federal Endangered Species Act |
| | U.S. Army Corps of Engineers – Shasta Dam and Reservoir Regulation Requirements |
| | U.S. Coast Guard Activities and Programs |
| | Uniform Relocations Assistance and Real Properties Acquisition Act of 1970, as amended (Public Law 91-646 and Public Law 100-17) |
| State | California Public Resources Code |
| | California Environmental Quality Act |
| | Clean Water Act Section 401 |
| | California Endangered Species Act |
| | California Fish and Game Code – Fully Protected Species |
| | California Fish and Game Code Section 1600 – Streambed Alteration |
| | Porter-Cologne Water Quality Control Act |
| | California Native Plant Society California Rare Plant Ranking System |
| | Reclamation Board Encroachment Permit |
| | California Water Rights |
| | State Lands Commission Land Use Lease |
| | State of California General Plan Guidelines |
| | California Department of Transportation Encroachment Permit and Activities, Programs |
| | California Land Conservation Act of 1965 (Williamson Act) |
| | California Native Plant Protection Act |
| | California Department of Boating Activities and Programs |
| | California Scenic Highway Program |
| | California Wild and Scenic Rivers Act |

**Table 6-12. Summary of Applicable Laws, Policies, Plans, and Permits Potentially Required (contd.)**

| Level | Laws, Policies, Plans, and Permits |
|---|---|
| Local | Shasta County Air Quality Management District Authority to Construct and Permit to Operate |
| | Shasta County Building Division Grading Permit |
| | Shasta County Zone Plan |
| | Shasta County Department of Public Works Encroachment Permit |
| | Shasta County General Plan |
| | Other Local Permits and Requirements |

### *Special Considerations Specific to Shasta Dam and Reservoir*

Additional considerations specific to implementing the NED Plan, involving Shasta Dam and Reservoir, are discussed below.

**Shasta-Trinity National Forest and National Recreation Area** Two important examples of laws, policies, and plans not directly relating to typical environmental compliance and coordination activities include the Whiskeytown-Shasta-Trinity NRA Management Guide (USFS 2014) and STNF LRMP (USFS 1995). These plans prescribe management practices for much of the Shasta Lake area and would be important in implementing any project authorized for construction. Shasta Lake is located within the Whiskeytown-Shasta-Trinity NRA, which consists of the Shasta and Trinity units (managed by USFS) and the Whiskeytown Unit (managed by the National Park Service). The Whiskeytown-Shasta-Trinity NRA Management Guide (USFS 2014) addresses management of resources, changes in technology, and recreation trends in the Shasta-Trinity National Forest and vicinity and is subject to the STNF LRMP including the applicable elements of the Northwest Forest Plan. It contains USFS goals and objectives, USFS standards and guidelines, management prescriptions to be applied to land areas, and management area direction.

**McCloud River** The McCloud River is not formally designated as either a National or State wild and scenic river; however, Section 5093.542 of the California PRC includes provisions that are intended to protect the free-flowing condition and wild trout fishery of the McCloud River. Section 5093.542(a) states that "maintaining the McCloud River in its free-flowing condition to protect its fishery is the highest and most beneficial use of the waters of the McCloud River within the segments designated in subdivision (b)." Section 5093.542(b) prohibits any "dam, reservoir, diversion, or other water impoundment facility" from 0.25 mile below McCloud Dam downstream to the McCloud River Bridge. McCloud Dam, which regulates flows into this reach of the McCloud River, is a PG&E facility that diverts a majority of the McCloud River flows into the Pit River basin. Section 5093.542 was established through enactment of the Wild and Scenic Rivers Act, as amended (PRC, Sections 5093.50 through 5093.70). Up to about 3,500 feet of the lower McCloud River above the McCloud River Bridge and within the special designation reach would be occasionally inundated if Shasta Dam were modified. Thus, the NED

Plan and other comprehensive plans would have some effect on the free-flowing condition of the McCloud River and the wild trout fishery within the part of the lower McCloud River protected by Section 5093.542 of the PRC. DWR and other State agencies, landowners, and various environmental groups have expressed concerns about potential impacts on McCloud River resources resulting from enlarging Shasta Dam and Lake.

Additionally, it is possible that State agency participation in potential enlargement of Shasta Dam and Reservoir could be limited due to the PRC. Section 5093.542(c) of the PRC states the following:

> *Except for participation by DWR in studies involving the technical and economic feasibility of enlargement of Shasta Dam, no department or agency of the state shall assist or cooperate with, whether by loan, grant, license, or otherwise, any agency of the federal, state, or local government in the planning or construction of any dam, reservoir, diversion, or other water impoundment facility that could have an adverse effect on the free-flowing condition of the McCloud River, or on its wild trout fishery.*

In addition, Section 5093.542(d) of the PRC states the following:

> *All state agencies exercising powers under any other provision of law with respect to the protection and restoration of fishery resources shall continue to exercise those powers in a manner to protect and enhance the fishery [of the protected segments of the McCloud River]*.

Participation by various State agencies in planning and potential construction activities associated with modifying Shasta Dam and Reservoir, including related permitting and approval processes, has varied by the agency's mandate and Section 5093.542 of the PRC. CDFW has taken the position that it must participate in preparing the EIS to comply with Section 5093.542(d). Other State agencies, including DWR and the State Water Board, have participated to a limited extent or expressed their intent to participate in the SLWRI. The CALFED Program Plan (CALFED 2000d) concluded that although Section 5093.542 seeks to protect the free-flowing condition of the McCloud River, it also provides for investigations of enlarging Shasta Dam. If the NED Plan or another plan is ultimately authorized and approved, it is possible that some State agencies will be unable to process and issue permits and approvals. This could preclude Reclamation from obtaining State approvals and permits, which could impede a project and frustrate Congressional intent.

In addition, effects to the McCloud River and related provisions in the PRC are also relevant to the recently passed Proposition 1. California voters approved Proposition 1, "Water Bond. Funding for Water Quality, Supply, Treatment,

and Storage Projects," on November 4, 2014, for $7.5 billion, which includes $2.7 billion for storage projects. However, provisions in Proposition 1, section 79751(a), related to Chapter 1.4 (commencing with Section 5093.50) of Division 5 of the PRC, may limit bond funding for a project if the State or its agencies determine that such actions are prohibited by Chapter 1.4 of the PRC. Section 79751 does not amend or modify the State PRC. Whether the State of California can use Proposition 1 funds in support of any plan potentially authorized related to enlargement of Shasta Dam and Reservoir is outside of Reclamation's authority and to be determined by the State of California.

**Reclamation Water Rights for Shasta Reservoir** The existing water rights for storage of water in Shasta Reservoir, along with historical storage data from 1944 to 2013, were evaluated to determine if additional storage rights would be needed for the NED Plan, CP4A. As described below, based on these evaluations it is not anticipated that additional or amended storage rights would be necessary to fully exercise the increase in storage provided by enlargement of Shasta Reservoir under the NED Plan.

As shown in Table 6-13, Reclamation holds three permits for storage in Shasta Reservoir, for a total combined storage of 4,493,000 acre-feet per year, representing the total amount of storage that can be added to Shasta Reservoir during the storage season.[3] Storage under these permits is further limited by the maximum amount actually stored in any one storage season during the development period (the period for determining beneficial use under the water right). The development period for Permits 12721, 12722, and 12723 ended on December 1, 1990. Maximum combined storage under these permits during the development period was 3,906,336 acre-feet, which occurred in the 1977/1978 storage season.

**Table 6-13. Water Right Permits for Storage in Shasta Reservoir**

| Storage Permit Information | Storage in Shasta Reservoir (acre-feet) | Storage Season | Maximum Storage During Development Period[1] (acre-feet) |
|---|---|---|---|
| Permit 12721 | 3,190,000 | October 1 to June 30 | 3,190,000 |
| Permits 12722 and 12723 (combined) | 1,303,000 | October 1 to June 30 | 716,336 |
| Total Shasta Reservoir Storage | 4,493,000 | - | 3,906, 336 |

Note:

[1] The development period for determining beneficial use for Permits 12721, 12722, and 12723 ended December 1, 1990. Highest storage under these permits during the development period occurred during the 1977/1978 storage season.

[3] Storage under water rights permits is calculated on a daily basis and includes both initial storage volumes filled during the storage season and refill volumes (when storage is added, used, then refilled in a single storage season).

Storage conditions in 1977/1978 have not occurred in any other storage season to date. During water year 1977/1978, reservoir storage levels on October 1 were close to dead pool, the winter and spring were extremely wet, and there were no environmental release requirements. This allowed almost the entire active storage space in Shasta Reservoir to fill in a single storage season (see Figure 6-2). This combination of events has not occurred in any other water year since storage began in Shasta Reservoir in 1944. After 1977/1978, the next highest storage season to date was 1992/1993, when 2,869,335 acre-feet was stored. The difference between the 1977/1978 season of storage and second highest season of storage is 1,037,001 acre-feet. This 1,037,001 acre-feet difference in storage under Shasta Reservoir water rights permits is substantially greater than the increased storage capacity from an 18.5-foot dam raise under CP4A (634,000 acre-feet).

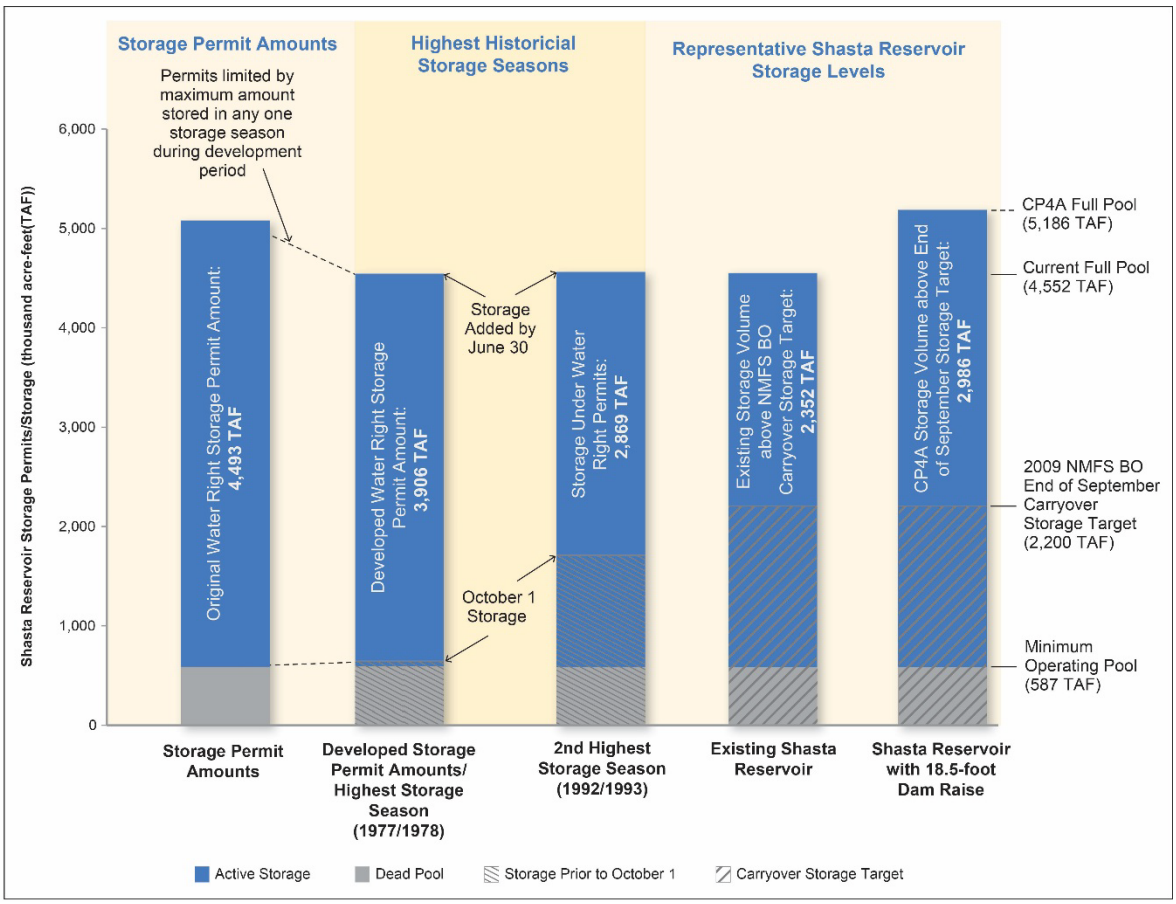


**Figure 6-2. Shasta Reservoir Water Rights, Historical Storage, and Representative Storage Volumes**

Conditions resulting in the highest historical storage seasons, such as 1977/1978, are unlikely to be repeated due to current regulatory requirements. This is primarily because environmental regulations, such as RPAs in the 2008 USFWS BO and the 2009 NMFS BO, have mandated increased environmental

requirements, such as Shasta Reservoir carryover storage and flows in the Sacramento River and the Delta. For example, the 2009 NMFS BO RPA includes an end-of-September carryover storage target for Shasta Reservoir of 2,200,000 acre-feet (to be met in at least 87 percent of years). To surpass the year of highest storage for an 18.5-foot dam raise under CP4A, October 1 storage would have to be less than 58 percent of the carryover storage target and a combination of high precipitation and limited environmental release requirements would have to allow complete refilling of the reservoir by the following June.

The State Water Board indicated that a new or amended storage right would not be necessary to fully exercise increased storage under CP4A if the volumes fall within the highest past authorized storage volume. Accordingly, Reclamation does not anticipate needing to apply for additional storage rights for Shasta Reservoir as part implementing CP4A.A full evaluation of the historic exercise of Shasta Reservoir storage rights will be made to demonstrate that no changes in water rights are needed to fully exercise increased storage under the NED Plan, as requested by the State Water Board. If the evaluation determines amended or new permits are needed, Reclamation would coordinate with the State Water Board to obtain amendments or new permits as necessary.

### Advanced Planning and Design Activities

If Congress authorizes and appropriates funds for construction of a project to enlarge Shasta Dam and Reservoir, then Reclamation would initiate activities in coordination with project partners and stakeholders to conduct and complete required advanced planning and design activities before implementation of the project. Several key activities include the following:

- Developing a post-authorization report to present the results of subsequent advanced planning actions, refinement of designs, cost estimates, updated analyses of potential effects and economics, and related NEPA and/or CEQA analyses and documentation, if necessary
- Establishing agreements with key project partners and stakeholders (e.g., USFS, Shasta County, PG&E, UPRR) related to planning, design, and construction activities
- Preparing detailed plans, specifications, and bid packages
- Establishing agreements for reimbursable project purposes, including repayment contracts
- Developing and/or revising operations, maintenance, and related plans
- Acquiring required lands, easements, and rights-of-way

### Project Construction and Transfer to O&M Status

After the feasibility study and resultant decision making, post-authorization environmental compliance and design efforts, permit application and approval process, and acquisition process described above, then project implementation efforts would transition to preparing and executing construction contracts, starting implementation of mitigation measures and/or construction activities, completing such construction activities, commissioning new facilities, and, finally, operating and establishing and/or transferring O&M responsibilities.

As described in the Engineering Summary Appendix (Attachment 5) to the accompanying EIS, for procurement and construction, project features have been divided into several work packages – the clearing package, dam raise package, Lakeshore Drive package, Pit River Bridge modification package, multiple vehicular roads and bridges packages, recreation facilities package, visitor center package, transmission line package, Pit 7 powerplant package, gravel augmentation package, and ecosystem restoration. Several key activities for each work package include the following:

- Procurement of construction contracts
- Construction of work packages, including mobilization, construction, and commissioning/start-up
- Transfer of facilities to O&M Status

## Federal and Non-Federal Responsibilities

If a plan is recommended for implementation, Federal and non-Federal obligations and requirements would be contained in a Project Cooperation Agreement (PCA).

### Federal Responsibilities

If recommended for implementation, Reclamation and/or future project partners or beneficiaries would perform preconstruction and design studies for the NED Plan, which may require updated economic and/or environmental analyses and documentation. After PCAs are signed and non-Federal sponsors have provided any required financial contributions and assurances, the Federal Government would acquire real estate and/or relocate displaced parties according to Public Law 91-646 and construct the project modifications and related mitigation requirements. Reclamation and other Federal agencies (e.g., USFS) would be responsible for various O&M activities, as shown in Table 6-14.

**Table 6-14. Potential Federal and Non-Federal Responsibilities for Various Project Component O&M**

| Facility | Responsibility |
|---|---|
| Shasta Dam and Powerplant | Reclamation |
| Reservoir Area Dikes | Reclamation |
| Railroad Bridges and Embankments | UPRR |
| Road Relocations (USFS facilities) | USFS |
| Road Relocation (Shasta County facilities) | Shasta County |
| Vehicular Bridges (Shasta County facilities) | Shasta County |
| Pit River Bridge Protection | UPRR/Caltrans |
| Recreation Facilities (USFS facilities) | USFS |
| Pit 7 Dam and Powerhouse Modifications | PG&E |
| Utilities | Various Federal and Non-Federal |

Key:
Caltrans = California Department of Transportation
O&M = operations and maintenance
PG&E = Pacific Gas and Electric Company
Reclamation = U.S. Department of the Interior, Bureau of Reclamation
UPRR = Union Pacific Railroad
USFS = U.S. Forest Service

### Non-Federal Responsibilities

Before implementation, the non-Federal sponsor(s) (i.e., beneficiaries) for reimbursable costs would agree to perform items of local and state cooperation specific to the authorized purposes of the project. One or more non-Federal sponsors needs to be identified for each of the reimbursable project purposes. For most and possibly all of the reimbursable purposes, the non-Federal sponsor would need to share in the cost of the NED Plan.

## Timeline and Status of Feasibility Study

Table 6-15 summarizes major activities that have either occurred, or are planned to occur, as a part of the SLWRI feasibility study. A timeline of major milestones, documents, and actions to complete the feasibility study, preconstruction planning and design, and construction phases is shown in Figure 6-3. If and when Congressional authorization and related appropriations occur, project implementation would take place in two phases. The initial phase would span approximately five years and would include developing detailed project designs, acquiring necessary permits, and acquiring required real estate interests and/or relocating displaced parties according to Public Law 91-646. Once these initial phase activities are complete, construction of major project features would begin. Construction activities would likely span approximately five years. Estimated timelines are based upon availability of sufficient funding on an annual basis.

**Table 6-15. Timeline and Status of Feasibility Study**

| Activity | Description |
|---|---|
| **Completed and On-going Activities** | |
| Appraisal Assessment for the Potential Enlargement of Shasta Dam and Reservoir | This appraisal-level study analyzes the range of enlargement options for the dam and reservoir and the potential costs. Report issued May 1999. |
| Feasibility Study Reinitiation | Based on the results of the Appraisal Assessment and completion of the Programmatic CALFED ROD in 2000, Reclamation reinitiates feasibility-scope studies in mid-2000 on the potential to enlarge Shasta Dam and Reservoir. |
| Feasibility Investigation Plan Formulation Strategy Summary | This report outlines four phases of the plan formulation process, the various decision documents, and the subsequent Draft and Final Feasibility Reports. Report issued July 2002. |
| Shasta Reservoir Area Inventory | The primary purpose of this report is to identify major infrastructure that may be subject to modification or relocation if Shasta Dam were raised up to 30 feet. Report issued February 2003. |
| Mission Statement Milestone Report | As first of the four Plan Formulation Phase reports, this report describes existing and future conditions, problems, needs, and opportunities, project objectives and planning considerations, and baseline technical information, and develops a mission statement to guide the study process. Report issued March 2003. |
| Office Report: Breakpoint Analysis | This office report primarily describes results of an analysis to identify dam raise elevations for which project costs significantly change because of the need for relocation or modification of major project features. (Report issued June 2003) |
| Office Report: Ecosystem Restoration Opportunities in the Upper Sacramento River Region | This report highlights existing environmental conditions and problems, ongoing conservation and environmental restoration programs in the study area, potential ecosystem restoration opportunities, and potential ecosystem restoration plan components for consideration in future planning efforts. Report issued November 2003. |
| Initial Alternatives Information Report | As second of the four Plan Formulation Phase reports, this report describes the formulation of initial alternatives to address planning objectives of the SLWRI. (Report issued June 2004) |
| SLWRI Notice of Intent | Pursuant to the National Environmental Policy Act, Reclamation issues a Notice of Intent to prepare an EIS for the SLWRI. Published in the Federal Register Oct. 7, 2005. |
| Environmental Scoping Report | This document reports on comments from, responses to, and results from, a series of public scoping meetings held throughout California for the SLWRI. Report issued February 2006. |
| Plan Formulation Report | As third of the four Plan Formulation Phase reports, this report outlines the formulation, comparison, and evaluation of comprehensive alternative plans that address SLWRI planning objectives. Report issued December 2007. |
| Draft Feasibility Report and Accompanying Preliminary Draft EIS | The Draft Feasibility Report included a Federal decision document and environmental compliance documentation by reference. The report described the study process, major results, preliminary proposed plan, Federal/non-Federal responsibilities and sponsorship, and future actions. |
| Draft EIS and Related Documents | The Draft EIS and related documents were circulated for public review and comment. |
| Final Feasibility Report and Accompanying Final EIS | This Final Feasibility Report evaluates and compares comprehensive plans and identifies the NED Plan. The Final EIS includes responses to public comments and identifies the Preferred Alternative. |

**Table 6-15. Timeline and Status of Feasibility Study (contd.)**

| Activity | Description |
|---|---|
| **Future Activities** | |
| Washington D.C.-level Review and Processing | The Final Feasibility Report and Final EIS will be reviewed and processed within the Department of the Interior and the President's Office of Management and Budget before public release. |
| Congressional Authorization | Congress will review and vote on whether to authorize the project. Legislation containing construction authorization would be sent to the President for approval. |
| Record of Decision | Interior will issue a ROD for the SLWRI. |

Key:
CALFED = CALFED Bay-Delta Program
EIS = Environmental Impact Statement
Final EIS = Final Environmental Impact Statement
Reclamation = U.S. Department of the Interior, Bureau of Reclamation
ROD = Record of Decision
SLWRI = Shasta Lake Water Resources Investigation

## Estimated Timeline to Complete Feasibility Study, Pre-Construction Design, and Construction Phases for Proposed Enlargement of Shasta Dam and Reservoir

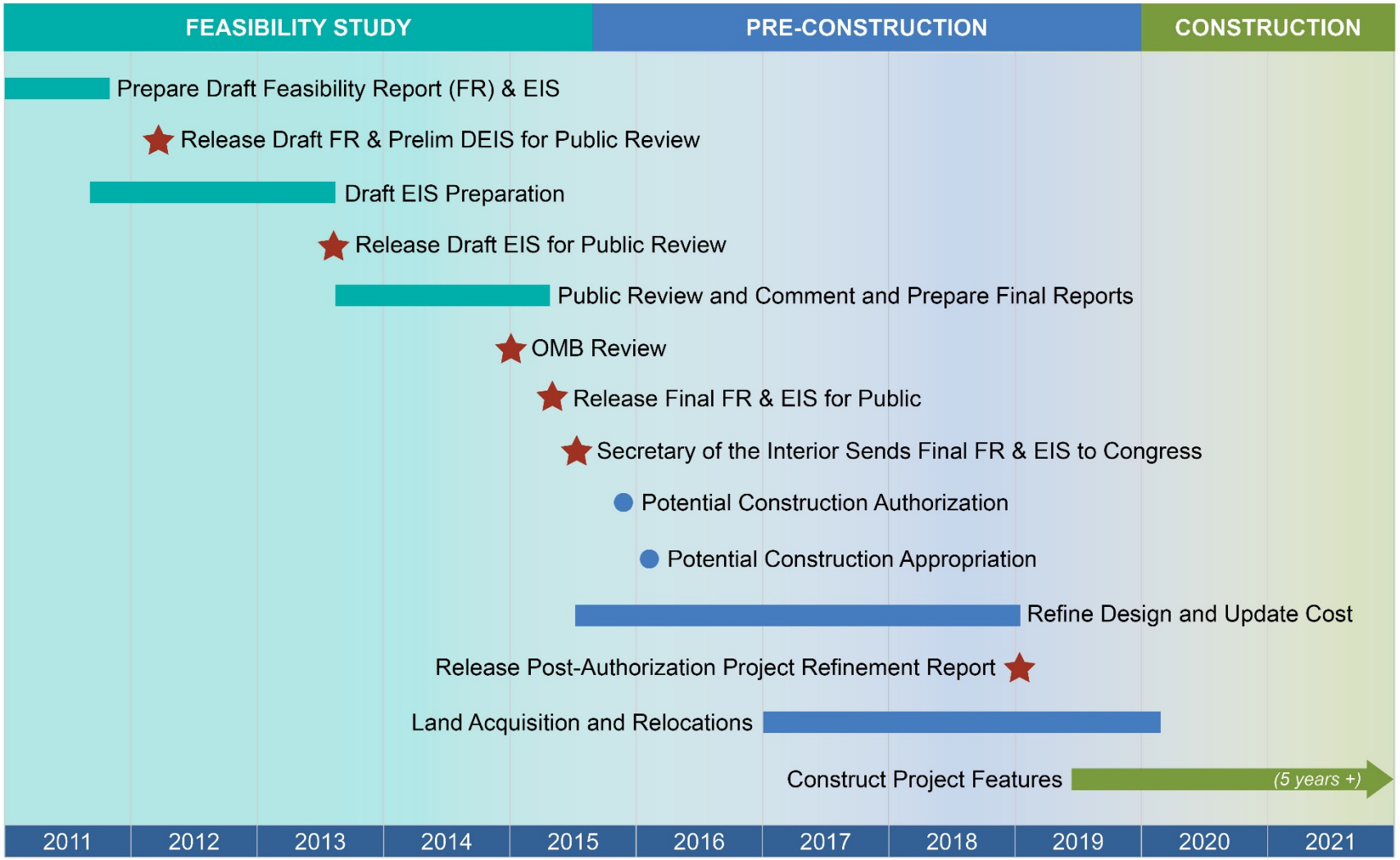


**Figure 6-3. Shasta Lake Water Resources Investigation Project Timeline**

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