Chapter 3

# Revisions to Chapter 3, "Project Alternatives"

*Chapter 3 of this document (the Draft SEIS/REIR) is being revised in response to public comments received on the Draft EIS/EIR (Jones & Stokes 2003). The majority of these changes would not change the text in such a way as to require recirculation for public comment. However, the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the State Water Resources Control Board (State Water Board) have deemed that the following changes to this chapter constitute significant new information. As a result, the lead agencies have included these changes here for public disclosure and comment. The complete revised chapter will be presented in the Final EIS/EIR.*

# Description of Project Alternatives

## Five Dam Removal Alternative—Proposed Action

### Inskip Diversion Dam/South Powerhouse

#### Project Elements

##### Access Road Improvements

**Proposed New Access Road between South Powerhouse and Inskip Diversion Dam.** Permanent vehicular access would be required to construct, operate, and maintain the proposed Inskip Diversion Dam fish screen and ladder and new tunnel outlet portal facilities. The new road would begin at the South Powerhouse and use the tailrace dike to cross the tailrace area. The road would then travel overland from a point near the tunnel inlet portal toward Inskip Diversion Dam fish screen and ladder facilities on the north side of South Fork Battle Creek. The proposed road alignment is shown on Figure 3-2c.

After crossing the tailrace channel via the tailrace dike, the 1,850-foot-long road would rise above the riparian vegetation zone and existing foot trail and then roughly parallel the slope to the vicinity of Inskip Diversion Dam. Construction of this section of the access road would require a 16-foot-wide cut with the upslope side of the road cut at a slope of 1½:1. The maximum cut in the slope would be 31 feet high. As the road approaches Inskip Diversion Dam, the road begins dropping to the level of the fish screen and ladder, where a large, flat

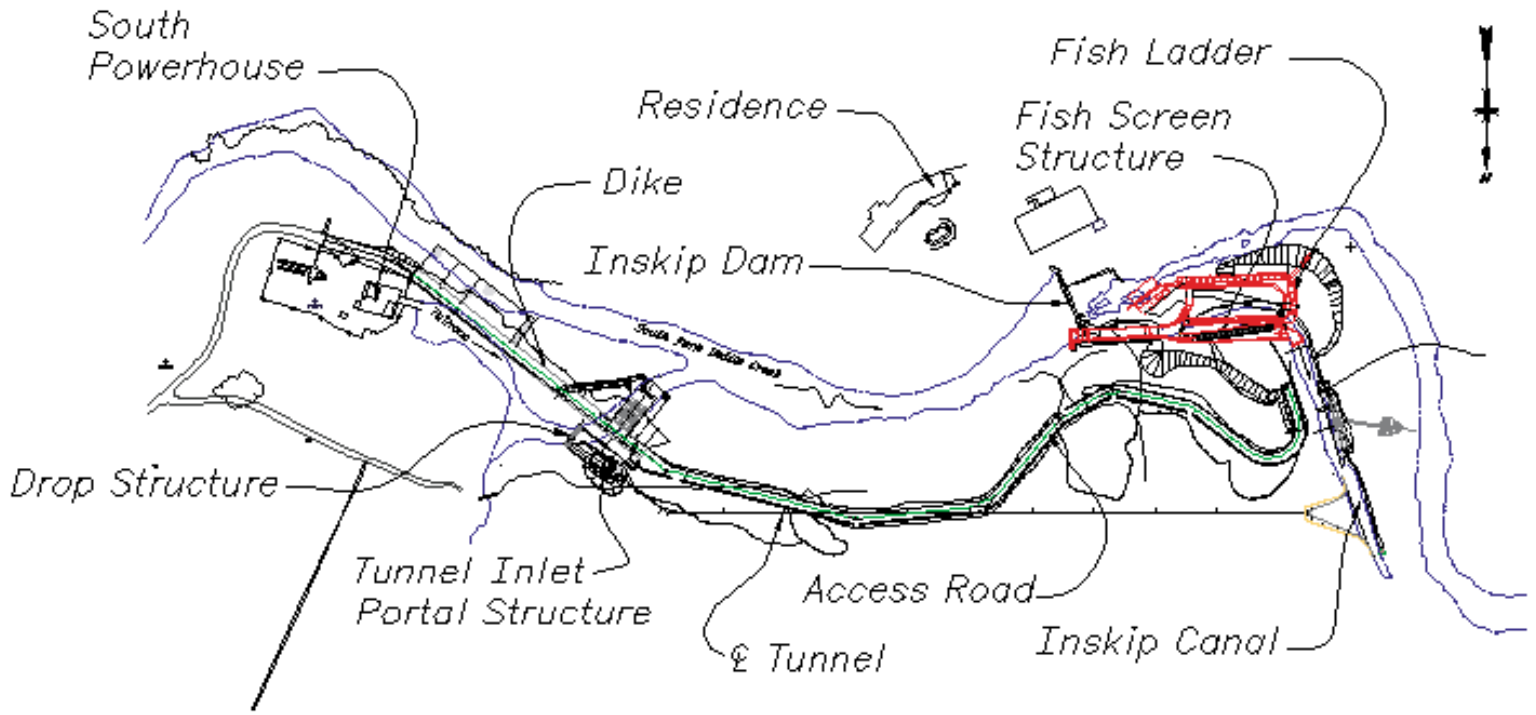
staging/parking area would be developed. This staging/parking area would be roughly 60 feet by 70 feet in size. This sloped area would be cleared and flattened to provide both construction access and long-term operation and maintenance staging. An additional spur road would be developed off the staging/parking area that parallels Inskip Canal along its upslope side to the bypass tunnel outlet portal area.

The proposed road would be 12 feet wide, with two turnouts (at the hill crest and curve) and an additional 4 feet of width to provide for hillside drainage and guardrails as required. The road would be designed to provide all-weather access to the various sites for operation and maintenance purposes. The entire length of the road would be provided with 6-inch gravel surfacing, and those portions of the road with slopes greater than 6% would be topped with a 3-inch-thick asphalt layer. A maximum grade of 12% was assumed in accordance with safety standards. A minimum radius curvature of 50 feet at centerline was assumed sufficient for concrete mixer–truck travel during construction.

Construction of the proposed access road would also require relocating one power pole and associated power line. This pole would be relocated upslope of the proposed road near its current location; the new site would be chosen to avoid impacts on trees and facilitate any needed rewiring.

**Access Road Options Eliminated from Further Consideration.** Two additional alignments were also considered to provide access to the Inskip Diversion Dam site. The first option is essentially the same as the proposed alignment described above except that it would cut into the saddle at the western end of the proposed alignment and would, therefore, partially obscure the view of the road from Oasis Springs Lodge. Based on field surveys and engineering design work, it was determined that selection of this option would result in the need for a higher cut slope and significantly more excavation, which could lead to a higher risk of erosion and the need for disposal of more excavated materials and, therefore, potentially greater environmental impacts. In addition, the cost of this road was estimated to be approximately $200,000 more than the cost of the proposed alignment. For these reasons, this option was eliminated from further consideration.

The second option, identified as the western alignment, was considered but also eliminated from further consideration because of the relatively higher costs of construction and substantially greater environmental impacts. Under the western alignment, the portion of proposed access road that crosses the peninsula area would remain the same as under the proposed alignment; however, the segment between the tunnel inlet portal and the fish screen and fish ladder facility would not be constructed. Instead, access to the fish facility parking area near Inskip Diversion Dam would be via a new road that would climb out of the canyon in a westerly direction approximately 4,000 feet to the top of the plateau. The new road would connect with an existing primitive road that follows the edge of the plateau and currently provides access between the South Powerhouse/Inskip Diversion Dam project site and the Lower Ripley Creek Diversion Dam project site.




No scale

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**Figure 3-2c**
**Proposed Facilities for the Inskip Diversion Dam/South Powerhouse**
**Five Dam Removal Alternative**

The western alignment would ascend from the parking area at the new fish facilities at a steep grade to avoid interfering with the outlet portal of the new bypass tunnel. The terrain that would be encountered in the first 2,000 feet of the western alignment is extremely rugged. Tall cliffs of competent rock and three major gullies in this reach would require that at least three bridges be constructed. Because of the irregular and steep nature of this initial terrain, significant excavation would be required to straighten the alignment enough to allow sufficient turning radius for maintenance vehicles and equipment. The remaining alignment passes through more gentle terrain but would still require rock excavation.

Similar to the proposed alignment, the western alignment would consist primarily of excavation with no fill. Excavated materials would be disposed of at locations on the plateau. The material would be placed in spoilbanks in piles shaped to minimize environmental impacts and to comply with landowner requirements.

The western alignment access road would be paved to allow all-weather access to the fish facility. Approximately 5,000 feet of the existing access road along the plateau would require grading and additional gravel to allow all-weather access to the fish facility.

In addition to greater construction requirements, the western alignment could potentially result in the following environmental impacts. These impacts are based on field observations performed by a Reclamation biologist during a site visit on September 15, 2004. Potential impacts include:

- disturbance of ephemeral, intermittent, and perennial drainages;
- more extensive removal of woody shrubs and trees, including oaks, than the proposed access alignment and the first alignment option described above;
- a larger construction footprint because of both steeper slope (i.e., wider footprint) and longer road length (i.e., longer footprint) compared to the proposed road alignment, resulting in greater effects on:
  - hydrology (i.e., the new western road alignment would intercept rainfall and subsurface water moving down the hill slope, which then would concentrate flow and divert drainage from flow paths it would normally take if the western alignment were not present),
  - site productivity (i.e., removing and disturbing topsoil, altering soil properties, changing microclimate, and accelerating erosion as a result of constructing the western alignment would disrupt biological communities),
  - water quality (i.e., increased road surface runoff), and
  - air quality (i.e., increased dust and emissions);
- increased habitat fragmentation and edge effects (i.e., the western alignment would increase barriers, adding to the dispersal of small mammals and predator access, and increase the potential to spread tree disease and invasive plant species, such as brown-headed cowbird brood parasitism); and

- increased nutrient input and road surface runoff into South Fork Battle Creek resulting from a steeper slope and greater water runoff velocity.

In addition to the potential environmental impacts listed above, the western alignment would be much more expensive to construct than the proposed alignment or the first alignment option described above. For these reasons, the western alignment was eliminated from further consideration at this site.

## Asbury Pump Station and Diversion Dam

Asbury Pump Station and Diversion Dam are located on Baldwin Creek approximately 0.7 mile upstream of its confluence with Battle Creek. Baldwin Creek has been identified as a source of cold water. The nature of the habitat in Baldwin Creek is limited such that it is expected only to provide habitat for small numbers of steelhead without any notable use by salmon. Releasing water at Asbury Diversion Dam delivers cold water from Darrah Springs to the mainstem of Battle Creek via Baldwin Creek to improve the summer holding conditions in that reach of the stream for the target species.

Asbury Diversion Dam has a maximum height of approximately 7 feet above the streambed. Although the dam does not have a fish ladder, fish such as steelhead are expected to pass over the dam during high streamflows because of its low height. Although fish could potentially pass above Asbury Diversion Dam, this condition has not been monitored, even when steelhead have been released from the Coleman National Fish Hatchery. During the type of high-flow events that are expected to facilitate passage of steelhead at the waterfall near the terminus of Baldwin Creek and at Asbury Diversion Dam, fast-moving, turbid water in Baldwin Creek makes it impossible to observe or capture fish.

### Project Elements

Under this alternative, proposed restoration actions in Baldwin Creek include a minimum instream release of 5 cfs from Asbury Diversion Dam, as required by the 1999 Memorandum of Understanding (MOU) (Appendix A). Cold spring water entering Baldwin Creek from Darrah Springs above the dam would be allowed to continue downstream of the dam site. PG&E would be required to operate a remote-sensing device to continuously measure and record total flow and stage fluctuations at the diversion dam during all operations to verify compliance with applicable provisions under the Federal Energy Regulatory Commission (FERC) license.

The instream release would be accomplished by fitting three or four existing bays with flow-measurement weirs, which would replace the flashboard weirs mounted on the crest of the dam. The use of multiple weirs would disperse the flow over a wide area, which is expected to reduce the potential for attraction to areas of higher passage potential. To ensure that the minimum flow of 5 cfs is

released over the flashboards, PG&E's Asbury Pump Station would continuously monitor the reservoir water level behind the dam. The pump station has an electronic controller that receives input from water-level sensors that transmit the water surface elevation of Asbury Pond behind Asbury Diversion Dam. The pump station then maintains the pond water surface elevation by discharging the correct amount of water. This ensures a constant release rate over the flashboards. Under flood conditions, the extra water that cannot be pumped simply spills over the flashboards and results in an increased release over the 5 cfs required.

A weatherproof, secure enclosure, such as a locked, vertical-oriented, 4-foot-diameter corrugated metal pipe (CMP), would be located above the creek. All necessary electronic and telemetry equipment would be housed inside the existing Asbury Pump Station.

Once the flow measurement weirs have been installed and are operational, PG&E would visit the site regularly to maintain the weir structures, including removing any debris that may be blocking the weir, and to ensure that flows required under the FERC license amendment are maintained. The elevation of the pond impounded behind Asbury Diversion Dam should not fall below a level that would ensure that a minimum flow of 5 cfs is released to Baldwin Creek. The elevation of the pond behind Asbury Diversion Dam would be continuously monitored and telemetered using the Pit 3 Switching Center, which is staffed 24 hours per day.

Asbury Diversion Dam impounds water to an approximate average depth of 3 feet near the dam. Under current operating conditions, a 10-foot-wide flashboard spill gate is periodically opened completely to allow sediments that accumulate behind the dam to pass through. Under future conditions, the gate sediment-pass-through operations may continue.

## Construction Considerations and Sequencing

Construction activities near Asbury Diversion Dam would include the following:

- **Overpour weirs.** The overpour weirs that would be constructed on Baldwin Creek would allow the 5-cfs instream flow release to be made in a distributed fashion at the top of the Asbury Diversion Dam. There would be no fewer than three overpour weirs at the dam that would eliminate a concentrated discharge from the dam to reduce the chance of false attraction for fish. The overpour weirs would skim water at the top of the Asbury Diversion Dam, and the water level will be held constant by a controller to provide a steady instream flow release unless high-water conditions exist. Under high-water conditions, the entire dam would act as an overpour weir and release water in addition to the required instream flow release.
- **Access trail.** A new access trail would be constructed between Asbury Diversion Dam and the staff gage used to verify flow release at the calibrated

stream section. This would involve vegetation clearing and minor hand excavating. The total area affected would be approximately 2,000 square feet.

# Alternatives Eliminated from Further Consideration

*A discussion of the Eight Dam Removal Alternative (originally identified as Alternative B in the cost review presented at the January 15, 2004, California Bay-Delta Authority Ecosystem Restoration Program Subcommittee meeting [Pacific Gas and Electric Company 2004]) was added to page 3-93 in the Draft EIS/EIR following the discussion of the previously eliminated Alternative 6 (i.e., decommissioning all diversion dams and powerhouse facilities below the natural fish barriers on Battle Creek). The Eight Dam Removal Alternative was not presented in the Draft EIS/EIR because the analysis of this alternative was requested following public circulation of the Draft EIS/EIR. Reclamation and the State Water Board are soliciting comments on the discussion of the Eight Dam Removal Alternative. An overview of the Eight Dam Removal Alternative is presented below, as it will be included in the Final EIS/EIR.*

## Eight Dam Removal Alternative (Alternative B)

Following public circulation of the Draft EIS/EIR (July through October 2003), a new alternative, the Eight Dam Removal Alternative, was proposed for analysis by the California Bay-Delta Authority (CBDA) outside of the National Environmental Policy Act (NEPA)/California Environmental Quality Act (CEQA) process. As part of this analysis, the Eight Dam Removal Alternative (identified as Alternative B in a cost analysis presented to the CBDA, Ecosystem Restoration Program Subcommittee meeting in January 2004 [Pacific Gas and Electric Company 2004]) is compared to the Proposed Action for the Restoration Project (identified as the Five Dam Removal Alternative in the Draft EIS/EIR [Jones & Stokes 2003] and also known as the MOU Alternative).

When the two alternatives are compared, habitat benefits for anadromous fish are found to be similar, with the Eight Dam Removal Alternative providing slightly more habitat benefit than the Five Dam Removal Alternative; however, both alternatives provide substantially more benefit to anadromous fish habitat than the No Action Alternative. Based on a May 2004 cost estimate update prepared by Reclamation, which was used to update the January 2004 economic analyses (PG&E 2004; Lubben pers. comm.), it was found that the overall cost of the Eight Dam Removal Alternative is approximately $3 million more than the Five Dam Removal Alternative. Therefore, this alternative is more costly and provides only slightly more habitat benefits for anadromous fish. In addition to differences in overall project costs, the primary difference between the two alternatives is that the Eight Dam Removal Alternative results in significant additional reduced energy production and a reduced ability to meet all Restoration Project objectives and CALFED Program objectives.

According to PG&E, the Five Dam Removal Alternative would result in an approximately 30% reduction in energy production, and the Eight Dam Removal Alternative would result in more than a 50% reduction (Navigant Consulting, Inc. 2004). Under California law, these respective losses of clean and renewable energy would need to be replaced from a renewable source. PG&E concluded that the additional power lost under the Eight Dam Removal Alternative would cost more than the savings in Restoration Project planning and implementation costs (including costs associated with construction of fish screens and ladders, decommissioning of Hydroelectric Project facilities, environmental compliance, monitoring and mitigation, Mount Lassen Trout Farm [MLTF] pathogen resolution, and future water acquisition) and operation and maintenance costs of the new facilities for the Five Dam Removal Alternative.

The Eight Dam Removal Alternative, therefore, would be substantially less effective than the Five Dam Removal Alternative in meeting the Restoration Project objective of minimizing the loss of renewable energy produced by the Hydroelectric Project. Additionally, the Eight Dam Removal Alternative does not meet an important CALFED Program objective that requires support from a willing participant. At this time PG&E, the owner and operator of the Hydroelectric Project, does not believe the Eight Dam Removal Alternative warrants further consideration (Livingston pers. comm. ).

In summary, the Eight Dam Removal Alternative was excluded from further consideration for the following reasons.

- Incremental habitat benefits of the Eight Dam Removal Alternative would be only marginally better compared to the Five Dam Removal Alternative.
- The cost of replacement energy for the Eight Dam Removal Alternative would be excessive.
- The Five Dam Removal Alternative better achieves a key project objective of minimizing the loss of clean and renewable energy produced by the Hydroelectric Project.
- The Eight Dam Removal Alternative lacks support of a willing participant, as required by the CALFED Program objectives.

In consideration of the above, the Proposed Action as described in the 1999 MOU and as defined earlier in this chapter (see the section titled Five Dam Removal Alternative—Proposed Action on page 3-19 of the Draft EIS/EIR) continues to represent the best balance of resources.

After several months of extensive investigation and discussions and further economic analyses, the members of the Battle Creek Project Management Team (PMT)—which includes the federal and state lead agencies for the Restoration Project (Reclamation and the State Water Board, respectively), the owner of the Hydroelectric Project (PG&E), and additional signatories to the 1999 MOU (DFG, USFWS, and NOAA Fisheries)—agree that the Eight Dam Removal Alternative should be removed from further consideration and that the Five Dam

Removal Alternative currently remains the best opportunity to restore significant amounts of habitat on Battle Creek while maintaining clean and renewable energy produced by the Hydroelectric Project.

## Background

In 1999, Reclamation, USFWS, DFG, NOAA Fisheries, and PG&E signed an MOU to pursue a restoration project in Battle Creek (Appendix A, "Memorandum of Understanding by and among Bureau of Reclamation, National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Game, and Pacific Gas and Electric Company," of the Final EIS/EIR [see also Appendix A in the Draft EIS/EIR]). This would entail PG&E voluntarily applying to the FERC to amend the Battle Creek Hydroelectric Project license. The MOU signatories considered several action alternatives for Battle Creek. When evaluating the different alternatives to select one as the Proposed Action, the MOU signatories considered the following specific objectives (see Chapter 2 of the Draft EIS/EIR):

- restore self-sustaining populations of Chinook salmon and steelhead by restoring their habitat in the Battle Creek watershed and access to it through a voluntary partnership with state and federal agencies, a third party donor(s), and PG&E;
- establish instream flow releases that restore self-sustaining populations of Chinook salmon and steelhead;
- remove selected dams at key locations in the watershed where the hydroelectric values would be marginal as a result of increased instream flow;
- dedicate water diversion rights for instream purposes at dam removal sites;
- construct tailrace connectors and install failsafe[1] fish screens and fish ladders to increase certainty about restoration components;
- restore stream function by structural improvements in the transbasin diversion to provide a stable habitat and guard against false attraction of anadromous fish away from their migratory destinations;
- avoid Restoration Project impacts on species of wildlife and native plants and their habitats to the extent practicable, minimize impacts that are unavoidable, and restore habitat or compensate for impacts;
- minimize loss of clean and renewable energy produced by the Battle Creek Hydroelectric Project;
- implement restoration activities in a timely manner;

[1] The MOU defines *failsafe* as a level of performance and reliability. Standards for fish ladders and fish screens are specified in Sections 2.10 and 2.11 of the MOU, respectively (see Appendix A in the *Draft EIS/EIR*). More specific information on fish ladders and fish screens is presented in Table 21 and Table 22, respectively, in the Adaptive Management Plan (Terraqua, Inc. 2004).

- develop and implement a long-term adaptive management plan with dedicated funding sources to ensure the continued success of restoration efforts; and
- avoid impacts on other established water users/third parties.

The MOU signatories identified the Five Dam Removal Alternative (MOU Alternative) as the Proposed Action. The Five Dam Removal Alternative includes the removal of five diversion dams, the installation of fish screens and fish ladders at three remaining dams and access roads to maintain these facilities, an increase of instream flows, the installation of new facilities to prevent the mixing of North Fork and South Fork Battle Creek waters, and an adaptive management plan. This alternative is described in detail in the 1999 MOU (Appendix A, "Memorandum of Understanding by and among Bureau of Reclamation, National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Game, and Pacific Gas and Electric Company," of the Final EIS/EIR [see also Appendix A and Chapter 3 in the Draft EIS/EIR and Chapter 3 of this report]). The environmental effects associated with construction and implementation of the Restoration Project under the Proposed Action and the action alternatives are evaluated in Chapter 4 of the Draft EIS/EIR (Jones & Stokes 2003), which was circulated for public review from July through October 2003. While the Eight Dam Removal Alternative is not evaluated as an action alternative, biological benefits and costs are compared and evaluated with the Five Dam Removal Alternative below.

## Technical Review of the Restoration Project

Subsequent to the signing of the MOU in 1999, CALFED (now known as CBDA) approved $28 million for the Restoration Project. However, primarily because of provisions in the MOU (and the conservative design philosophies established pursuant to the MOU provisions), a more detailed understanding of the site conditions, and development of environmental compliance documentation and project designs, it became apparent that additional funds would be required to complete the Restoration Project. Because of the increased funding estimate, the CBDA (formerly CALFED) Selection Panel formed an independent technical review panel (TRP) to review the technical merit of the Restoration Project. The TRP presented its findings in the *Technical Review Panel Report for the Battle Creek Salmon and Steelhead Restoration Project* (TRP Report), dated September 2003 (Borcalli et al. 2003).

The TRP indicated in its report that in the context of the Proposed Action (MOU alternative), the costs of the elements of the project were reasonable, justified, and cost-effective. However, the TRP noted that this finding does not address the strategic approach taken in the MOU, which identified the Five Dam Removal Alternative as the Proposed Action to balance the needs of fisheries and power production.

The CBDA Selection Panel recommended that the Battle Creek PMT consider a more comprehensive decommissioning of the Hydroelectric Project as a project alternative to determine whether increased benefit could be achieved.

## Cost Review of Additional Alternatives Considered

While the PMT was preparing a formal response to the TRP Report in December 2003, the California Resources Agency, a state agency within CBDA, requested that a cost review be conducted on the MOU Alternative (the Five Dam Removal Alternative) in comparison with additional alternatives. The CBDA Selection Panel asked that this analysis take place outside the context of this NEPA/CEQA process.

In response to the California Resources Agency's request, a group of economists and engineers from Reclamation, Environmental Defense, the California Hydropower Reform Coalition (CHRC), Natural Heritage Institute, The Metropolitan Water District of Southern California (MWD), and PG&E used FERC's current cost economic method to conduct a cost review of the MOU Alternative compared with several additional alternatives. The cost review team identified three additional alternatives, which are identified as Alternatives A, B, and C below. Figure 2-2 (following page 2-6 in the Draft EIS/EIR) provides an overview of existing facilities in the project area.

- Alternative A (decommissioning the entire Hydroelectric Project, including PG&E's facilities upstream of the natural fish passage barriers on Battle Creek);
- Alternative B (Eight Dam Removal Alternative, i.e., decommissioning all diversion dams below the natural fish passage barriers on Battle Creek, with the exception of Asbury Pump Diversion Dam); and
- Alternative C (Alternative 6; see page 3-91 of the Draft EIS/EIR [Jones & Stokes 2003], i.e., decommissioning all diversion dams and powerhouse facilities below the natural fish passage barriers on Battle Creek).

The cost review team concluded that the use of FERC's current cost economic method and the resulting findings adequately represented the relative costs of the various alternatives. The cost review team considered only the financial costs, including planning and implementation costs (including costs associated with construction of fish screens and ladders, decommissioning of Hydroelectric Project facilities, environmental compliance, monitoring and mitigation, MLTF pathogen resolution, and future water acquisition), and the loss of hydroelectric power associated with the alternatives. The cost analysis did not include relative environmental benefits.

The cost review team presented their preliminary findings at the CBDA Ecosystem Restoration Program (ERP) Subcommittee meeting January 15, 2004.

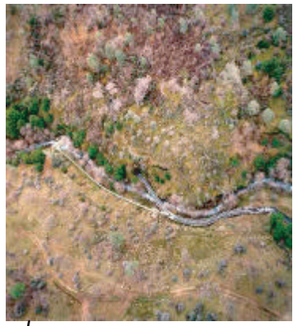
# *Battle Creek Salmon and Steelhead Restoration Project*

## Project Area Limits

*WILDCAT DIVERSION DAM*

*EAGLE CANYON DIVERSION DAM*

*NORTH BATTLE CREEK FEEDER DIVERSION DAM*



*SOAP CREEK FEEDER DIVERSION DAM*

*COLEMAN DIVERSION DAM*

*INSKIP DIVERSION DAM*

*SOUTH DIVERSION DAM*

Grace Lake
Lake Nora
Al Smith Canal
North Battle Creek Reservoir
McCumber Reservoir
Keswick Canal
Volta Powerhouse
North Battle Creek Feeder Diversion Dam
Natural Fish Barrier
Al Smith Diversion Dam
Volta Powerhouse #2
Keswick Diversion Dam
North Battle Creek Feeder
**Upper Project Limit**
Eagle Canyon Diversion Dam
Upper Ripley Creek Feeder
Upper Ripley Creek Diversion
Darrah Springs Hatchery
Baldwin Creek
Asbury Diversion Dam
Wildcat Diversion Dam
BATTLE CREEK
NORTH FORK
Wildcat Canal
Eagle Canyon Canal
Cross Country Canal
Ripley Creek
Coleman Forebay
Coleman Canal
Lower Ripley Creek Feeder
Lower Ripley Creek Diversion
Inskip
Soap Creek
Soap Creek Feeder
Soap Creek Diversion
Coleman National Fish Hatchery
Coleman Powerhouse
SACRAMENTO RIVER
BATTLE CREEK
SOUTH FORK BATTLE CREEK
Inskip Powerhouse
Union Canal
South Powerhouse
South Canal
Coleman Diversion Dam
Inskip Diversion Dam
South Diversion Dam
Coleman National Fish Hatchery Weir
**Lower Project Limit**
**Upper Project Limit**
Natural Fish Barrier

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**Figure 2-2**
**Restoration Project Facilities and Project Area Limits**

Subsequently, an independent consultant[2] reviewed the preliminary findings and refined the energy production estimates in April 2004. (DFG and MWD recommended that Navigant, which had assisted with the original cost analysis for the 1999 MOU, reevaluate the January 2004 preliminary findings prepared by the cost review team.) Also, as part of the May 2004 proposal to CBDA for supplemental Restoration Project funding, Reclamation updated the planning and implementation costs to more accurately reflect current pricing of the Restoration Project. These updated cost analyses were incorporated into the January 2004 preliminary findings, which resulted in the August 2004 cost analysis presented in Tables 3-8 and 3-9. Table 3-8 summarizes and compares the MOU alternative and additional Restoration Project alternatives based on the implementation costs. Table 3-9 supports the information in Table 3-8. The uncertainties associated with planning and implementation costs, as well as the costs of forgone energy, were assessed by using ranges of values. The cost ranges, shown in parentheses in Table 3-8, account for these uncertainties.

The preliminary cost review completed in January 2004 indicated that the MOU Alternative (the Five Dam Removal Alternative) and Alternative B (the Eight Dam Removal Alternative) were similar in cost. However, the revised cost review completed in August 2004 (presented in Tables 3-8 and 3-9) shows that the expected project costs associated with the Five Dam Removal Alternative are actually less costly than the Eight Dam Removal Alternative ($113 million and $116 million, respectively). Because the remaining alternatives (Alternatives A and C) were substantially more expensive than the MOU Alternative, they were excluded from further consideration. Based on the preliminary cost results, it was decided at the January 2004 ERP Subcommittee meeting that the PMT would further compare the potential incremental habitat benefits of Alternative B and the MOU Alternative.

## Comparison of the Five Dam Removal Alternative and the Eight Dam Removal Alternative

At the request of the ERP Subcommittee, the PMT formed a group of technical experts to analyze the biological differences between the Five Dam Removal Alternative (MOU Alternative, see Figure 3-2) and the Eight Dam Removal Alternative (Alternative B, see Figure 3-6). Specifically, a group of experts, including representatives from Reclamation, USFWS, DFG, The Nature Conservancy, PG&E, and the CHRC, analyzed habitat benefits, which include geomorphology, habitat and temperature, hydrology, and fish passage. The following topics were also analyzed to clearly define the differences between the Five Dam and Eight Dam Removal Alternatives:

- habitat benefits associated with both alternatives,
- risk of transferring serious and catastrophic fish diseases to other fish communities and state waters in California,

[2] Navigant Consulting, Inc., Battle Creek Salmon Restoration Project model output dated April 27, 2004.

- direct project costs and hydroelectric energy reductions associated with both alternatives, and
- the ability of both alternatives to meet Restoration Project objectives and CALFED Program objectives.

The results of each topic are summarized below.

## Habitat Benefits

The Battle Creek PMT, including representatives from Reclamation, the California Department of Water Resources (DWR), USFWS, NOAA Fisheries, and DFG, conducted a comparative analysis of the habitat benefits associated with the Five Dam Removal Alternative and the Eight Dam Removal Alternative. The resource agencies concluded that, compared to the existing conditions present under the current FERC license, both alternatives would significantly improve habitat and passage conditions for the target species. However, the habitat and passage conditions predicted for the Eight Dam Removal Alternative did not represent a significant improvement over those predicted for the Five Dam Removal Alternative.

Table 3-10 summarizes the findings with respect to geomorphology, habitat and temperature, hydrology, and fish passage. These findings were also discussed at the March 15, 2004, public meeting held in Red Bluff, California, and are presented in detail in a draft report entitled *Further Biological Analyses for Information Presented on March 15, Regarding the Differences between the Five Dam Removal Alternative and the Eight Dam Removal Scenario* (DFG 2004). Additional information related to SNTEMP limitations is located in the March 15, 2004, public meeting record and in Appendix R, "Water Temperatures in the Battle Creek Restoration Area," of the Final EIS/EIR (see also Appendix M, "Instream Flow Effects on Water Temperatures in the Battle Creek Restoration Area," of the Draft EIS/EIR) (Jones & Stokes 2003). The Nature Conservancy prepared a separate analysis of sediment transport under the Five Dam Removal Alternative and the Eight Dam Removal Alternative (The Nature Conservancy 2004). Electronic copies of both reports are found on the Restoration Project Web site:

http://www.usbr.gov/mp/battlecreek/.

The CHRC also provided a review of incremental biological benefits associated with the Five Dam and Eight Dam Removal Alternatives and provided comments on the PMT's analysis. CHRC presented their review at the public meeting held in Red Bluff on March 15, 2004. Their analysis is detailed in a report entitled *Analysis of Dam Removal Alternative B, Battle Creek Salmon and Steelhead Restoration Project* (California Hydropower Reform Coalition 2004). A copy of CHRC's report is found on the Restoration Project Web site:

http://www.usbr.gov/mp/battlecreek/.

**Table 3-8.** General Cost Review of Memorandum of Understanding Alternative and Additional Restoration Alternatives

| Alternative | Description | Estimated Cost (million U.S. Dollars) |
|---|---|---|
| MOU Alternative—Five Dam Removal | Negotiated in the 1999 MOU and identified as the Proposed Action in the EIS/EIR (the Five Dam Removal Alternative); includes the removal of five diversion dams, the installation of fish screens and fish ladders at three remaining diversion dams, an increase of minimum instream flows, the installation of new facilities to prevent the mixing of North Fork and South Fork Battle Creek waters, and an adaptive management plan. | $113 (range from $104 to $130) |
| Alternative A | Represents decommissioning the entire Battle Creek Hydroelectric Project, including PG&E's facilities upstream of the natural fish passage barriers on Battle Creek; this alternative was not evaluated in the Draft EIS/EIR because it did not meet the project objective of minimizing the loss of clean and renewable hydroelectric power. | $209 (range from $180 to $233) |
| Alternative B—Eight Dam Removal | Represents decommissioning all diversion dams downstream of the natural fish passage barriers on Battle Creek (the Eight Dam Removal Alternative); this alternative is the MOU Alternative plus the decommissioning of the three remaining diversion dams downstream of natural fish barriers and, therefore, does not include the installation of fish screens and fish ladders; although this alternative was not evaluated in the Draft EIS/EIR, it has characteristics similar to Alternative 6 (Alternative C described below); unlike Alternative 6, this alternative does not include decommissioning PG&E's powerhouse facilities downstream of the natural fish barriers. | $116 (range from $101 to $128) |
| Alternative C | Represents decommissioning all facilities downstream of the natural fish passage barriers on Battle Creek (Alternative 6; see the Draft EIS/EIR); this alternative is the MOU Alternative plus the decommissioning of the three remaining diversion dams and powerhouse facilities (except the two Volta Powerhouses) downstream of the natural fish passage barriers and, therefore, does not include the installation of fish screens and fish ladders; this alternative was eliminated from further consideration during the scoping process and, therefore, was not evaluated in the Draft EIS/EIR because it did not meet the project objective of minimizing the loss of clean and renewable hydroelectric power (see Chapter 3 in the Draft EIS/EIR under Alternatives Eliminated from Further Consideration). | $147 (range from $125 to $165) |

Sources: Pacific Gas and Electric Company 2004; Lubben pers. comm. 2004.

Note: The estimates presented in this table are subject to change because of factors such as changing construction material costs. Final estimated costs for the Five Dam Removal Alternative (Proposed Action) will be provided through a California Bay-Delta Authority Proposal Solicitation Package process to seek additional funding for the Restoration Project.

EIS/EIR = environmental impact statement/environmental impact report.

MOU = memorandum of understanding.

PG&E = Pacific Gas and Electric Company.

**Table 3-9.** Detailed Cost Review of Memorandum of Understanding Alternative and Other Restoration Alternatives

| Battle Creek Salmon and Steelhead Restoration Project Cost Summary | | | | |
|---|---|---|---|---|
| | Proposed Action (MOU) with Cost Sharing | Alternative A Decommission Entire Battle Creek Hydro Project | Alternative B Decommission All Diversion Downstream of Natural Barriers | Alternative C Decommission All Facilities Downstream of Natural Barriers |
| **Average annual energy**, GWh | **160.9** | **0** | **110.4** | **59.3** |
| Average annual energy, percent reduction | 30% | 100% | 52% | 74% |
| **Total planning and implementation costs, $** thousands | **69,076** | **94,110** | **47,907** | **54,645** |
| Design and construct screens and ladders, with connectors/bypass | 29,484 | 0 | 0 | 0 |
| Decommissioning costs, with connectors/bypass | 19,145 | 70,800 | 36,097 | 33,335 |
| Environmental compliance, monitoring and mitigation | 9,810 | 23,310 | 11,810 | 21,310 |
| MLTF pathogen problem resolution | 5,500 | 0 | 0 | 0 |
| Future water acquisition | 3,000 | 0 | 0 | 0 |
| Reimbursed forgone power (net present value) | 2,137 | 0 | 0 | 0 |
| **Sensitivity analyses**, net present value in 2004 dollars, millions | | | | |
| 1. Expected case | | | | |
| Planning and implementation costs | 69.1 | 94.1 | 47.9 | 54.6 |
| Replacement power costs | 41 | 136 | 71 | 101 |
| Increased O&M | 2 | (21) | (3) | (9) |
| Total | 113 | 209 | 116 | 147 |
| 2. Power value uncertainty | | | | |
| A. 4-cent power values | | | | |
| Planning and implementation costs | 69.1 | 94.1 | 47.9 | 54.6 |
| Replacement power costs | 32 | 107 | 56 | 79 |
| Increased O&M | 2 | (21) | (3) | (9) |
| Total | 104 | 180 | 101 | 125 |
| B. 6-cent power values | | | | |
| Planning and implementation costs | 69.1 | 94.1 | 47.9 | 54.6 |
| Replacement power costs | 49 | 160 | 83 | 119 |
| Increased O&M | 2 | (21) | (3) | (9) |
| Total | 120 | 233 | 128 | 165 |
| 3. Construction of cost uncertainty | | | | |
| A. Construction costs 10% less than expected | | | | |
| Planning and implementation costs | 62.2 | 84.7 | 43.1 | 49.2 |
| Replacement power costs | 41 | 136 | 71 | 101 |
| Increased O&M | 2 | (21) | (3) | (9) |
| Total | 106 | 200 | 111 | 142 |
| B. Construction costs 25% more than expected | | | | |
| Planning and implementation costs | 86.3 | 117.6 | 59.9 | 68.3 |
| Replacement power costs | 41 | 136 | 71 | 101 |
| Increased O&M | 2 | (21) | (3) | (9) |
| Total | 130 | 223 | 128 | 161 |

Sources: Pacific Gas and Electric Company 2004; Lubben pers. comm. 2004.

Note: The estimates presented in this table are subject to change because of factors such as changing construction material costs. Final estimated costs for the Five Dam Removal Alternative (Proposed Action) will be provided through a California Bay-Delta Authority Proposal Solicitation Package process to seek additional funding for the Restoration Project.

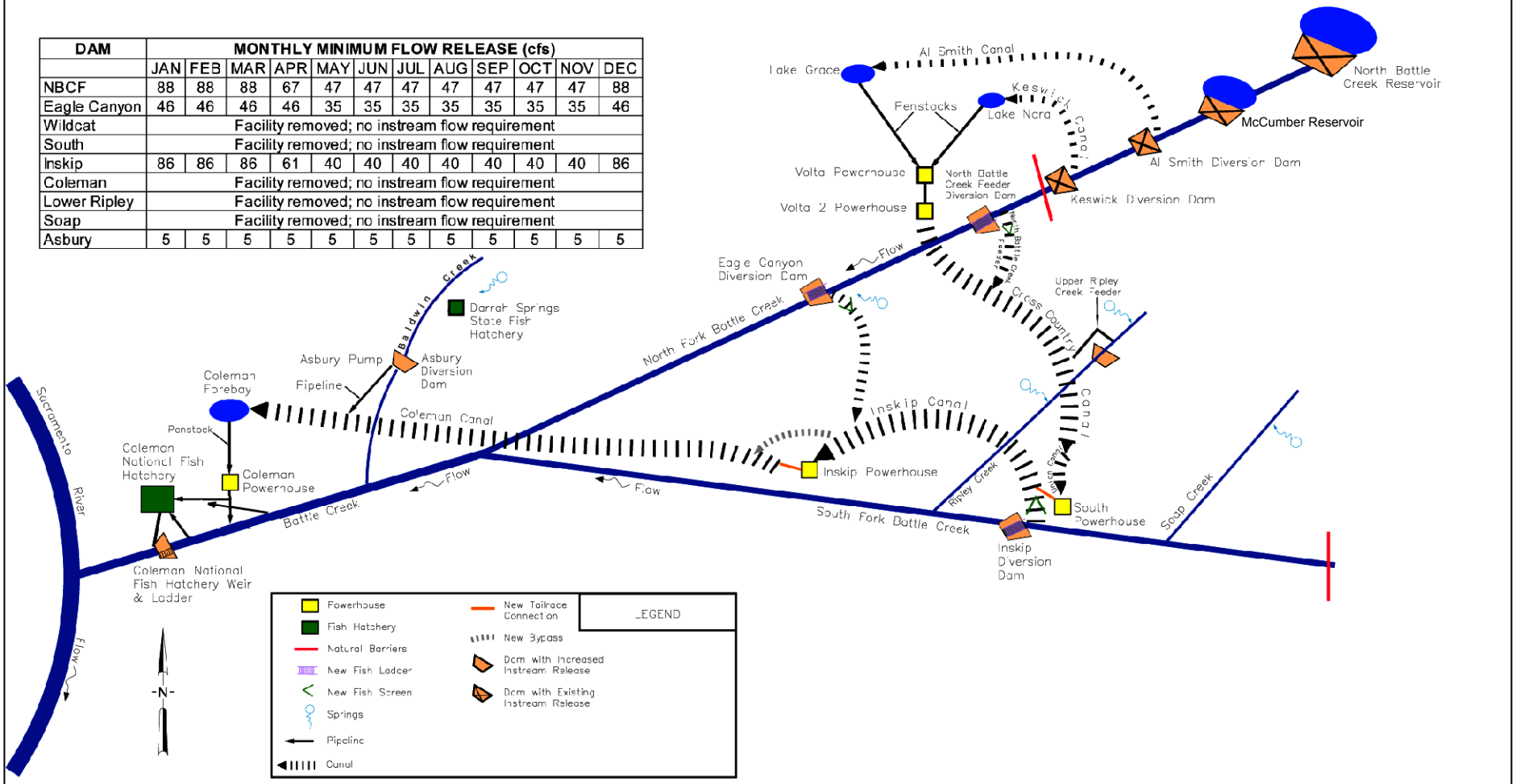
GWh = gigawatt hours.

MLTF = Mount Lassen Trout Farm.

MOU = memorandum of understanding.

O&M = operation and maintenance.

| DAM | MONTHLY MINIMUM FLOW RELEASE (cfs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| NBCF | 88 | 88 | 88 | 67 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 88 |
| Eagle Canyon | 46 | 46 | 46 | 46 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 46 |
| Wildcat | Facility removed; no instream flow requirement | | | | | | | | | | | |
| South | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Inskip | 86 | 86 | 86 | 61 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 86 |
| Coleman | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Lower Ripley | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Soap | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Asbury | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |




BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT
Battle Creek near Manton, California

Battle Creek Schematic

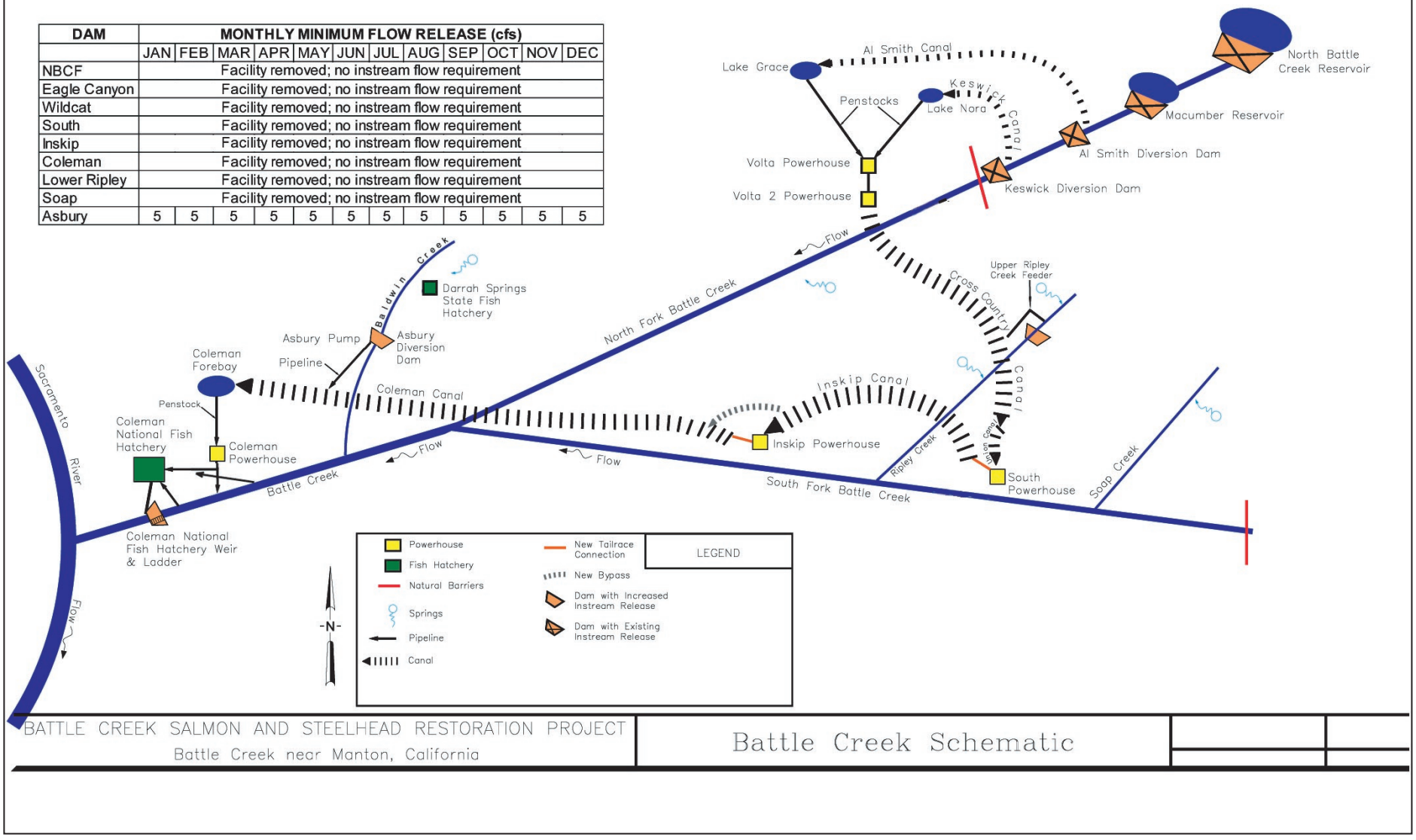
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT
Revision Date: June 26, 2001

DRAWING : Battle Creek
Sheet of

03035.03-001

**Figure 3-2**
**Five Dam Removal Alternative**

| DAM | MONTHLY MINIMUM FLOW RELEASE (cfs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| NBCF | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Eagle Canyon | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Wildcat | Facility removed; no instream flow requirement | | | | | | | | | | | |
| South | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Inskip | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Coleman | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Lower Ripley | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Soap | Facility removed; no instream flow requirement | | | | | | | | | | | |
| Asbury | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |




03035.03-001I

**Figure 3-6**
**Eight Dam Removal Alternative**

**Table 3-10.** Comparison of the Incremental Benefits of the Five Dam and Eight Dam Removal Alternatives



| Factor | Comparison of the Eight Dam Removal Alternative and the Five Dam Removal Alternative |
|---|---|
| Geomorphology | Removing the additional three diversion dams under the Eight Dam Removal Alternative (including North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams) does not provide substantial improvement in sediment transport characteristics necessary for maintaining spawning areas because the dams are too small to appreciably alter the magnitude or duration of flow events and sediment transport. |
| Habitat and Temperature | Removing the additional three diversion dams under the Eight Dam Removal Alternative does not substantially increase the predicted minimum amount of habitat usable by the target species for spawning or rearing or substantially improve the temperature regime for fish in each stream reach. Improvement is indicated by changing the temperature range from less tolerable to more tolerable for temperature-sensitive life stages. During the summer, the valley reaches of Battle Creek are not suitable for the most-temperature-sensitive life stages of the target species under either alternative, and in some cases even with the unimpaired flow. The Five Dam Removal Alternative provides more adaptive management opportunity for creating coldwater refugia below major springs on North Fork Battle Creek by controlling the mixing rate of surface water with cooler spring water. Removal of all dams, as recommended under the Eight Dam Removal Alternative, would result in less adaptability to manage coldwater refugia created by springs. |
| Habitat—Spawning/Rearing | Water temperature is higher in the mainstem and lower run reaches under the Five Dam Removal Alternative, but this area is not used for winter-run Chinook salmon spawning habitat. The colder upper reaches are only slightly warmer, and there is no difference for the farthest reaches compared with the Eight Dam Removal Alternative. Water temperature is colder on the mainstem and lower run reaches under the Eight Dam Removal Alternative, but still not cold enough to be beneficial for winter-run Chinook salmon spawning habitat. The upper reaches are only slightly cooler, and for the farthest reaches, there is no difference from the Five Dam Removal Alternative. The Adaptive Management Plan for the Five Dam Removal Alternative has the ability to acquire additional surface water or spring release as needed to improve the temperature regime (see Table 17 in the Draft Adaptive Management Plan [Terraqua, Inc. 2004]). |
| Habitat—Hydrology | The Five Dam Removal Alternative uses the prescription flow set by the Battle Creek Project Management Team and described in the 1999 Memorandum of Understanding (MOU) (1999) as the *large flows*. These flows more closely approximate the optimal flows for the various life stages of Chinook salmon and steelhead compared to the Eight Dam Removal Alternative. However, given the natural variability of the system, the difference between the two alternatives is small. The Eight Dam Removal Alternative appears to result in more variable flows that may or may not be optimal for all life stages of Chinook salmon and steelhead. However, given the natural variability of the Battle Creek system, the difference between the two alternatives is small. |
| Hydrology | Removing the additional three diversion dams under the Eight Dam Removal Alternative does not substantially change the manner in which streamflows fluctuate within the natural range of flows for this location and season. This is attributable to the lack of storage in the Battle Creek hydroelectric system, which would impair runoff, and the small diversion capacity of the run of the river dams relative to wet season events. The main difference between the two alternatives is flow level. The Five Dam Removal Alternative would have lower flows than the Eight Dam Removal Alternative. The Eight Dam Removal Alternative would have higher flows than the Five Dam Removal Alternative and essentially represents natural conditions. It is possible that there are additional ecosystem benefits from essentially providing natural flow conditions. Spence |

| Factor | Comparison of the Eight Dam Removal Alternative and the Five Dam Removal Alternative |
|---|---|
| | et al. discuss the importance of salmonid habitats having streamflows that fluctuate within the natural range of flows for the given location and season (Spence et al. 1996). |
| Fish Passage | Under the Five Dam Removal Alternative, fish ladders would be installed at the three dam sites that would be removed under the Eight Dam Removal Alternative. The fish ladders are scientifically designed and would result in only limited instances of passage delay. Under the Eight Dam Removal Alternative, the three additional diversion dams would be removed and flows would be increased; however, increased flows would not necessarily improve fish passage. There are channel features that can become barriers at both high and low flows, and the optimal unimpaired flow level is less than the maximum flows. Because of the uncertainty related to fish passage, the same level of adaptive management is expected for both alternatives. Under the Five Dam Removal Alternative, more maintenance work on fish screens and ladders would be required. Under the Eight Dam Removal Alternative, less maintenance would be required because no fish screens and fish ladders would be constructed at the project sites.<br><br>Because of all the uncertainty associated with fish passage of natural barriers, it is difficult to determine whether one alternative is better than the other. Different areas may act as barriers at higher flows rather than lower flows. |
| Sediment Transport | There is little difference between the two alternatives with respect to sediment bedload transport. Differences between the two alternatives with respect to fine sediment transport are unknown but expected to be minimal. |
| Power Generation | The Five Dam Removal Alternative would result in the generation of 30% less power for the Hydroelectric Project. The Eight Dam Removal Alternative would result in the generation of 50% less power for the Hydroelectric Project. Also, there would be no backup system if an emergency resulted in a system shutdown. |
| Uncertainties—Project Long-Term Success | There is greater uncertainty associated with the continued successful operation of the proposed fish passage facilities under the Five Dam Removal Alternative. Because there would be fewer human-made facilities, there would be more certainty associated with the Eight Dam Removal Alternative. |
| Uncertainties—MOU | The MOU is complete and was signed in 1999 by the five signatories (U.S. Department of the Interior, Bureau of Reclamation [Reclamation]; U.S. Fish and Wildlife Service [USFWS]; National Marine Fisheries Service [NOAA Fisheries]; California Department of Fish and Game [DFG]; Pacific Gas and Electric Company [PG&E]). There is some uncertainty associated with whether a new MOU for the Eight Dam Removal Alternative could be negotiated in a timely manner or even negotiated successfully (Livingston pers. comm. 2004). |
| Uncertainties—Community Support | The Battle Creek Watershed Conservancy (BCWC) has indicated in a letter to Reclamation that they do not support the Eight Dam Removal Alternative (Lucas pers. comm. 2004). The BCWC does support the Five Dam Removal Alternative contingent on the Four Agencies (i.e., NOAA Fisheries, USFWS, DFG, and Reclamation) meeting the four proposed agency actions outlined in a letter from the BCWC to the Four Agencies dated February 23, 2004 (Battle Creek Watershed Conservancy 2004). |

Source: Bureau of Reclamation and State Water Resources Control Board. 2004.

Although the PMT (and DFG) concluded that the Eight Dam Removal Alternative failed to provide any significant biological advantages over the Five Dam Removal Alternative (see summary in Table 3-10), the CHRC asserts that, compared with the Five Dam Removal Alternative, the Eight Dam Removal Alternative (Alternative B) would substantially increase summer base flows, restore interannual flow variability in summer, reduce temperatures in most areas, and reduce North Fork/South Fork mixing. The report also emphasized the importance of the descending limb of the hydrograph, i.e., the transition from the winter (high) to summer (low) flow season (Norlander pers. comm.).

The CBDA conducted a peer review of the biological analyses prepared by DFG and that prepared by the CHRC entitled *Review of Documents Related to Alternatives for Dam Removal* (CBDA 2004). A copy of this technical report is found on the Restoration Project Web site:

http://www.usbr.gov/mp/battlecreek/.

## Risk of Transferring Serious and Catastrophic Fish Diseases

Naturally spawning Chinook salmon and steelhead are known to carry virulent diseases that can have serious adverse effects on other anadromous and non-anadromous fish communities (USFWS 1997a). Many of these diseases are waterborne and can be passed into groundwater supplies (Pert pers. comm.). As part of the Hydroelectric Project, PG&E canals divert water from Battle Creek to various project powerhouses. Currently, Battle Creek water seeps into the local shallow groundwater table as it passes through two unlined PG&E canals—Eagle Canyon Canal and Inskip Canal. Groundwater that may become contaminated with these fish diseases resurfaces as natural springs that two MLTF facilities—Jeffcoat (including Jeffcoat East, Jeffcoat West, and the Jeffcoat nursery) and Willow Springs—use as its main water supply. The canal seepage could potentially transport waterborne pathogens from Battle Creek into the spring-fed water supplies of these MLTF facilities. Resident rainbow trout above the MLTF intake have commingled in the past with wild anadromous fish and would continue to commingle under the No Action Alternative or existing conditions; therefore, the resident rainbow trout are potential carriers of diseases that are also carried by anadromous fish and considered a possible threat to MLTF rainbow trout. Because resident rainbow trout would continue to be present in MLTF's water source under the Eight Dam Removal Alternative, there would be a slight risk of disease transmission to MLTF that is considered to be less than the No Action Alternative or existing conditions and substantially less than any of the Action Alternatives.

Implementing the Restoration Project would increase the abundance and upstream distribution of Chinook salmon and steelhead in Battle Creek, which could increase the incidence of pathogens in PG&E's canals diverting Battle Creek water. Water leaking from PG&E's canals could then contaminate the water source for MLTF's Jeffcoat and Willow Springs facilities, which in turn

could contaminate its farmed trout. Once their farmed trout are infected, MLTF could transmit waterborne diseases to other waters in the state of California by stocking those waters with diseased fish (Cox pers. comm.). This increased risk of infecting fish communities and waters throughout California is analyzed as a significant fish impact and a significant water quality impact in this report (see Impacts 4.1-8 and 4.4-4, respectively, in Chapter 4) because the effects of waterborne diseases can be particularly serious for fish that reside in waters where such diseases do not occur and, therefore, do not have as much immunity to the disease. This increased risk is also considered a significant water quality impact and a socioeconomic effect on MLTF (Impact 4.4-3 and Effect 4.16-4). To reduce these impacts to a less-than-significant level, Reclamation will implement the mitigation measure described under Impact 4.1-8. Because a structural solution is not possible to eliminate the hydrologic connection between Inskip Canal and MLTF's Willow Springs facility, investigations are currently ongoing to determine the feasibility of implementing four different mitigation options at this site, including the construction of an on-site disinfection facility, relocating Willow Springs operations to an off-site facility to raise rainbow trout where the water source is not hydrologically connected to waters that support anadromous fish, modifying Willow Springs business operations to ensure that hatchery fish are not stocked in other waters in the state, or acquiring the Willow Springs aquaculture business. Implementing these mitigation measures would address the risk of transferring serious and catastrophic fish diseases throughout California.

The impacts described above would be less than significant under the Eight Dam Removal Alternative because Eagle Canyon Canal would be decommissioned under this alternative and would no longer divert Battle Creek water that may transport pathogens to the water source for MLTF's Jeffcoat facilities. Although Inskip Canal would continue to divert water under the Eight Dam Removal Alternative, the source of its water would be diverted from Battle Creek above natural fish barriers where there would still be some risk of being exposed to diseases from resident fish carrying virulent fish diseases but not to the extent as under the No Action Alternative or existing conditions. Although there would continue to be a slight risk of disease transmission to MLTF under the Eight Dam Removal Alternative, because this risk is less than the No Action Alternative or existing conditions, the risk of transporting pathogens to MLTF's Willow Springs water via Inskip Canal under the Eight Dam Removal Alternative would be considered less than significant.

## Planning and Implementation Costs and Hydroelectric Energy Reductions

According to the May 2004 cost estimate prepared by Reclamation for the Restoration Project, planning and implementation costs for the Five Dam Removal Alternative are estimated to be greater ($69 million) compared to the Eight Dam Removal Alternative ($48 million) (see Table 3-9). Additionally, an

independent consultant[3] determined that the Eight Dam Removal Alternative would result in more than a 50% reduction of renewable energy production from the Battle Creek Hydroelectric Project (see Table 3-9). In contrast, using the same consultant's model, the Five Dam Removal Alternative would result in approximately a 30% reduction of energy production (see Table 3-9). The increase in forgone renewable energy production from 30% to 50% results in the Eight Dam Removal Alternative being more costly overall when replacement power costs are taken into consideration. Because there is no significant difference in the amount of habitat improvement, the Eight Dam Removal Alternative is not preferred.

### Replacing Lost Hydroelectric Energy

Under current California law, these respective losses of renewable energy mentioned above would need to be replaced by a renewable resource within the state. The California Energy Commission (CEC) and the California Public Utilities Commission (CPUC) have interrelated proceedings that specify the procedure for obtaining a renewable energy contract[4]. Under these proceedings, replacement power may be obtained through the Renewable Portfolio Standard (RPS) solicitation process (see, Pub. Util. Code section 399.11, et seq.). Figure 3-7 shows the timeline for the California Energy Action Plan presented on the CPUC Web site. Dates are included for illustrative purposes and are subject to change. Figure 3-7 shows the overall RPS implementation process and the required actions of the CPUC, the CEC, and the state's investor-owned utilities (IOUs).

On June 9, 2004, the CPUC issued Decision (D.) 04-06-015, an Opinion Adopting a Market Price Referent (MPR) Methodology. This methodology requires that the CPUC estimate the long-term market price of electricity for use in evaluating bids received during an RPS power solicitation. The CPUC sets the MPR as a benchmark market price at or below which a contract bid is considered to be reasonable. If a contract bid is made above this price, it is possible that the CEC could determine that an energy developer is eligible to receive Supplemental Energy Payments (SEPs) greater than the value of the MPR up to the amount of the bid. In order to ensure that the market price established by the CPUC does not influence the amount of a bid submitted through the competitive solicitation or that the bid does not influence the value of the MPR, an electric corporation cannot share the results of any competitive solicitation until the CPUC has established market price benchmark. Once the final contract value is agreed upon, the IOU would prepare and file an advice letter for the CPUC to approve the contract.

PG&E analyzed the possibility of replacing the reduction in energy production between the two alternatives with an alternative renewable energy source (Livingston pers. ). PG&E determined that the best option for replacement power would be a long-term contract. A long-term contract would approximate

[3] Navigant Consulting, Inc. Battle Creek Salmon and Steelhead Restoration Project model output dated April 27, 2004.
[4] The CPUC proceedings associated with renewable energy include R.01-10-024, R.04-04-026, and R.04-04-003.

the long-term certainty of an existing hydroelectric facility. However, until a CPUC–approved renewable energy procurement process is developed, several regulatory and marketplace uncertainties surrounding long-term renewable energy contracts would make an accurate assessment of this option difficult. These uncertainties include the terms and conditions of renewable power purchase contracts, market price, and the availability of supplemental energy payments for the seller; currently, there is no publicly available forecast of the actual cost of purchasing renewable power. Based on several uncertain assumptions (i.e., contract terms, conditions, duration, and price), PG&E procurement specialists concluded that a long-term power contract replacing the forgone energy would cost more than the reduction in planning and implementation costs plus operation and maintenance savings. As a result, when considering replacement power costs, the Five Dam Alternative Removal is expected to be the lower-cost restoration alternative compared to the Eight Dam Removal Alternative. Table 3-9 presents a detailed comparison of reduced hydroelectric power and planning and implementation costs associated with the Five Dam Removal Alternative and the Eight Dam Removal Alternative.

### Preferred Voluntary FERC License Amendment Option

PG&E reaffirmed its commitment to the 1999 MOU and the Proposed Action (the Five Dam Removal Alternative) in a letter presented to the Four Agencies (DFG, NOAA Fisheries, USFWS, and Reclamation) on April 6, 2004 (Livingston pers. comm.). In its letter, PG&E noted the PMT's conclusion that there is not a significant difference in the amount of anadromous fish habitat improvement with the Eight Dam Removal Alternative compared to the Five Dam Removal Alternative. PG&E further stated that after 8 months of extensive collaborative investigation of scenarios outside of the 1999 MOU, it is clear that the MOU remains the best opportunity to restore significant amounts of habitat on Battle Creek while maintaining a viable, renewable Hydroelectric Project. PG&E concluded that, while it appreciates the opportunity to collaborate with other stakeholders, it believes that the extensive additional information gathered regarding the Eight Dam Removal Alternative demonstrates that further consideration of this alternative is unnecessary. Therefore, PG&E remains committed to the Five Dam Removal Alterative and does not offer the Eight Dam Removal Alternative as a voluntary license amendment option.

## Ability to Meet Project Objectives and CALFED Program Objectives

One of the project objectives identified for the Restoration Project, as described in Chapter 2 of this report (see the Draft EIS/EIR), is to minimize the loss of clean and renewable energy produced by PG&E's Hydroelectric Project. As mentioned above, the Eight Dam Removal Alternative would result in more than a 50% reduction of renewable energy production. In contrast, the Five Dam Removal Alternative would result in approximately a 30% reduction of energy production. Given the significant reduction in renewable energy production resulting from the Eight Dam Removal Alternative, the Five Dam Removal Alternative better achieves this important project objective.

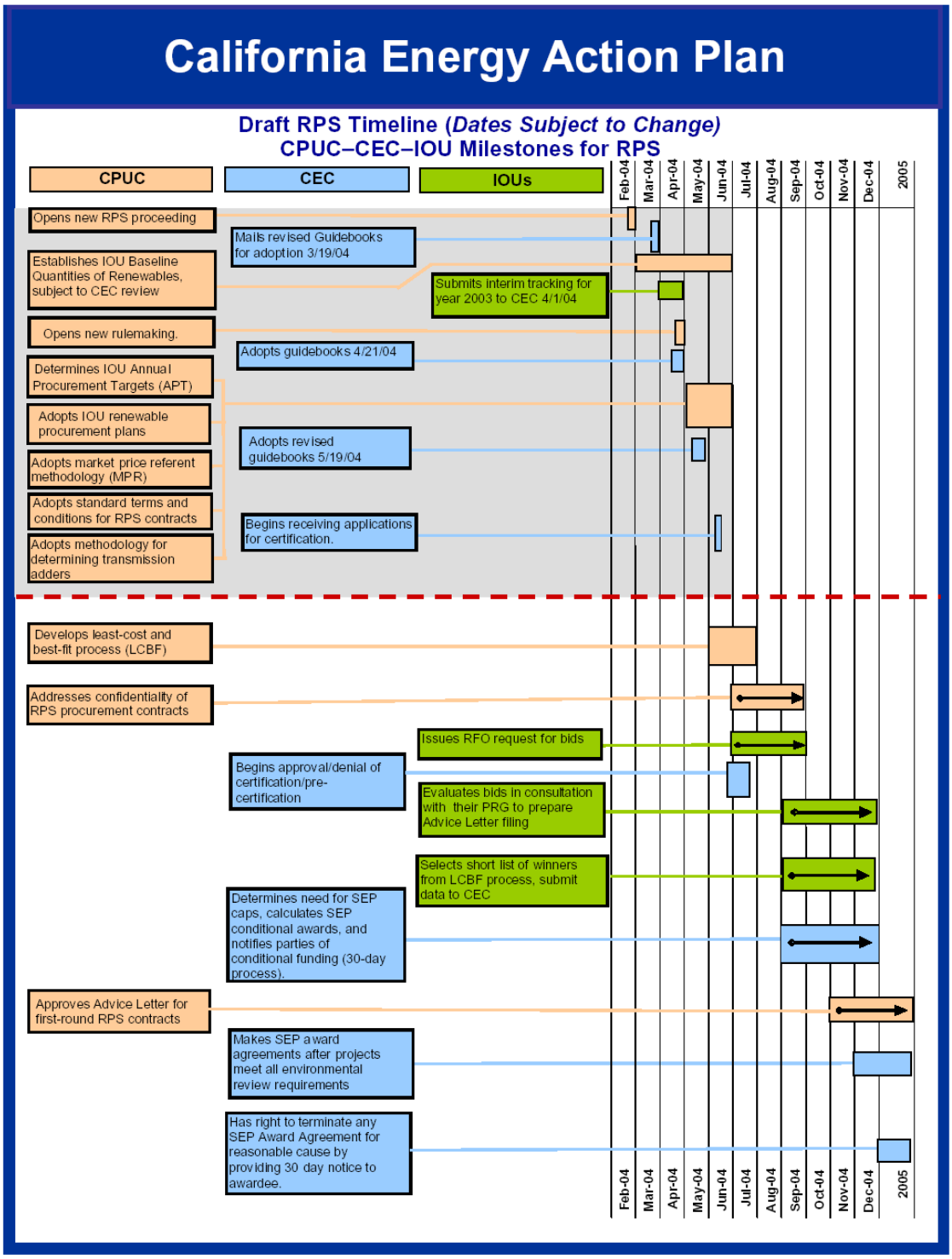



**Figure 3-7**
**California Energy Action Plan**

The CALFED Program objectives, as defined by the Record of Decision (CALFED Program 2000b), include solution principles that any CALFED project must satisfy. Because the Battle Creek Restoration Project is tiered from the CALFED Record of Decision, the Eight Dam Removal Alternative and Five Dam Removal Alternative were evaluated according to the solution principles, which are listed below.

- **Reduce Conflicts in the System.** *Solutions will reduce major conflicts among beneficial users of water.* Water in the Battle Creek project area is presently used for hydroelectric power generation and to provide limited fish habitat. Because the Eight Dam Removal Alternative would result in all the sideflow water downstream of the natural barriers being used for fish, and none of the water would be used for hydroelectric power generation, it is unlikely that this alternative would reduce conflicts within the system.
- **Be Equitable.** *Solutions will focus on solving problems in all problem areas. Improvements for some problems will not be made without corresponding improvements for other problems.* The Eight Dam Removal Alternative and the Five Dam Removal Alternative both help to solve anadromous fish habitat issues by improving habitat in Battle Creek; however, the Eight Dam Removal Alternative significantly increases the loss of renewable energy produced by the Battle Creek Hydroelectric Project and eliminates all of the hydroelectric potential from sidewater in the Restoration Project area. In addition, there is not a significant difference in the amount of improved habitat that the Eight Dam Removal Alternative provides over the No Action Alternative as compared to the amount of improved habitat that is provided by the Five Dam Alternative over the No Action Alternative (USFWS 2004).
- **Be Affordable.** *Solutions will be implementable and maintainable within the foreseeable resources of the CALFED Bay-Delta Program and stakeholders.* As explained above under the section titled Planning and Implementation Costs and Hydroelectric Energy Reductions, the total cost for the Eight Dam Removal Alternative is expected to be more than for the Five Dam Removal Alternative, resulting in the Five Dam Removal Alternative being the more affordable alternative.
- **Be Durable.** *Solutions will have political and economic staying power and will sustain the resources they were designed to protect and enhance.* Under the Eight Dam Removal Alternative, the dedication of water rights to the environment in perpetuity as described under the Five Dam Removal Alternative has not been discussed. At this time PG&E does not believe the Eight Dam Alternative warrants further consideration (Livingston pers. comm. ), and the State Water Board can transfer water rights only to instream environmental purposes that are voluntarily offered by the owner, regardless of the FERC action.
- **Be Implementable.** *Solutions will have broad public acceptance and legal feasibility, and will be timely and relatively simple to implement compared with other alternatives.* The Eight Dam Removal Alternative is not implementable because it lacks a willing participant (i.e., PG&E) (Livingston

pers. comm. ), which is a requirement of any CALFED project. In addition, the majority of the local community does not support the Eight Dam Removal Alternative as stated by the Battle Creek Watershed Conservancy (Lucas pers. comm. ).

- **Have No Significant Redirected Impacts.** *Solutions will not solve problems in the Bay-Delta system by redirecting significant negative impacts, when viewed in their entirety, in the Bay-Delta or other regions of California.* As mentioned above, implementation of the Eight Dam Removal Alternative would require procurement of significantly more renewable replacement energy. In response, the CHRC has proposed to use wind power to compensate for the incremental loss of hydropower associated with the Eight Dam Removal Alternative (California Hydropower Reform Coalition 2004). However, power generation from wind turbines would result in additional environmental impacts, such as raptor mortality resulting from collisions with wind turbines, viewsheds altered by the construction of new wind farms, and noise, depending on the size and location of the facility. This increment of additional redirected impact could be considered significant, depending on details associated with the source of replacement power.

In summary, the Five Dam Removal Alternative better meets the Restoration Project objectives and the CALFED Program objectives. Implementation of the Five Dam Removal Alternative is more equitable than the Eight Dam Removal Alternative and better reduces conflicts among beneficial water users of Battle Creek by meeting the Restoration Project objectives to restore habitat for self-sustaining populations of Chinook salmon and steelhead and minimize the loss of clean and renewable hydroelectric power generation. According to the cost estimates presented in this document, the Eight Dam Removal Alternative is expected to be more expensive than the Five Dam Removal Alternative. Most importantly, the CALFED Program objectives require that the Proposed Action for the Restoration Project must have broad public acceptance as well as a willing participant. The Battle Creek Watershed Conservancy, which represents the local community, does not support the Eight Dam Removal Alternative. Additionally, PG&E, the owner and operator of the Hydroelectric Project, is committed to the Five Dam Removal Alternative and does not believe the Eight Dam Removal Alternative warrants further consideration as a voluntary license amendment option.