Technical Panel Review Form
CALFED Ecosystem Restoration Program

CALFED ERP Project No.:	**#223DA**
Directed Action Proposal Title:	**Battle Creek Salmon and Steelhead Restoration Project**
Reviewer:	**Joint Battle Creek Review Panel**

Introduction

The Battle Creek Restoration Plan proposes a valuable conservation project for anadromous salmonids. It is a bold, innovative and desirable approach to the restoration of unique aquatic habitat in the upper Sacramento Basin. The Joint Battle Creek Review Panel (JBCRP) believes that the current version of the plan has adequately addressed previous comments concerning issues of dam removal and fish passage, and we believe that proposed removal of dams should proceed as scheduled. We continue to have some reservations concerning aspects of project design that concern response of the physical habitat and fish community to dam removals, however, and we make recommendations for additional steps to improve these aspects of the proposal before funding for this other work is released.

Our review of the Battle Creek Restoration Plan has been greatly hindered by the enormous number of documents that, together, appear to constitute the "plan". Many of the individual components of the plan, e.g. EIS/EIR, were developed in direct response to legal requirements that are not themselves part of a typical CBDA proposal package. Also, the plan is complicated by many multi-jurisdictional issues and by a partly artificial separation of Coleman National Fish Hatchery (CNFH) operations (and development of an Adaptive Management Plan (AMP) for CNFH) from the restoration plan's independent AMP. As a consequence, our experiences as reviewers of the proposed plan were full of frustrations at not always knowing "where is this topic addressed?". In many cases, we suspect that important issues have been considered by the plan's proponents, but we have been unable to determine "where" (i.e., in what document and at what pages). Although we understand that it may not be feasible to produce a single comprehensive document, we believe strongly that the plan needs a single project summary document that briefly summarizes the main components of the project, identifies the major issues that are raised with respect to restoration, provides a clear timeline for execution of the various elements of the plan, and provides a clear and accurate description of the documents and pages at which the most important topics are addressed.

For reference, a list of reviewed documents reviewed or used by the Technical Review Panel is attached in the Appendix at the end of the report.

1. **Goals.** Are the goals and objectives of the project clearly stated and internally consistent? Do they define success in unambiguous and measurable terms?

The revised proposal shows significant improvements in the goals of the Battle Creek Restoration Plan that concern dam removal and operation, fish passage, and cold water

benefits provided through flow management. The broader ecological goals are better defined than in previous documents, but they are still ambiguous about the relationships among local restoration, basin restoration, and regional restoration. In particular, the role of the Battle Creek project in overall Sacramento River conservation efforts and in regional conservation efforts is not well defined. The goals should optimize tradeoffs between fish and habitat restoration and the hydro system rather than "maximizing" fish production or "minimizing" hydropower disruption. Competing objectives, tradeoffs and constraints should be fully discussed in the goals.

The project team has partially responded to the recommendations of the CNFH Science Panel. In particular, they have indicated that steelhead, spring and winter-run Chinook salmon have higher priority than fall and late fall Chinook salmon, and they have specified interim population objectives for these species. The long-term objectives for fall and late fall Chinook remain ambiguous; Statewide restoration goals still appear to call for a production goal of 10,000 fall run Chinook in Battle Creek. The same is true for reintroduction strategies for all species. Interim quantitative spawner escapement goals are set at 1,000 adults for each species, are based on NOAA Fisheries viability standards, and are independent of predicted habitat in the restored Battle Creek's system. These population goals should instead be based on realistic estimates of expected future habitat capacity. Also, the goals remain focused primarily on restoration of anadromous salmonids. To be consistent with the ERP's ecosystem focus, the project should also address key species of non-anadromous fish and other organisms that would benefit from a restored Battle Creek system in addition to broader ecological concerns such as ecosystem connectivity, distribution of habitat types, and restoration of natural habitat forming processes.

2. **Ecological Benefit.** Are the benefits for endangered or threatened fish species or fish species that are candidates for listing clearly described? Does the Adaptive Management Plan adequately address all the significant uncertainties identified by the two technical panels? Does the Adaptive Management Plan include a decision-making process capable of making full use of the information collected in the monitoring and evaluation program?

The proposal describes the general benefit of restoring habitat for fish species that are recognized as being at risk (federal status as threatened or endangered under ESA; state sensitive species). It also describes the unique environmental characteristics of the Battle Creek basin, especially its predictable, high volume of cold water derived from springs and aquifers during the summer months.

The proposal fails to discuss the ecological benefits of the project for the larger Sacramento River system and central California region. Interrelationships between the Battle Creek salmon stocks and conspecific populations in the remainder of the Sacramento River are inferred but not thoroughly discussed. The proposal implies that the Battle Creek populations would serve as "source populations" for other streams in the Sacramento River system during periods of low salmonid abundance. While plausible, several factors (e.g., low population abundance, geographic separation, geographic location within the river network) raise many questions. The proposal never explicitly identifies the "degree of benefit" nor the mechanisms that would produce those broader benefits for the remainder of the Sacramento system.

The AMP provides an extensive list of uncertainties in response to the Technical Review Panel report. The development and prioritization of this list was systematic and reasonable. However, a major factor identified by both the Technical Review Panel and the CNFH Science Panel—influence of environmental factors in the Sacramento River downstream of Battle Creek, in the estuary, and in the ocean on survival rates and migration success— is omitted in this list of uncertainties. The proposal and AMP would be strengthened by including these and other factors that are external to Battle Creek basin but may have substantial impact on restoration of anadromous salmonids in Battle Creek.

The AMP for the CNFH should be integrated with the AMP for Battle Creek and should not proceed in isolation from development of a fish management plan for the watershed. The proposal and AMP address few of the uncertainties raised by the CNFH Science Panel. The restoration proposal includes, as an attachment, a separate proposal to develop a CNFH AMP. It's impossible to tell from this proposal whether the uncertainties identified by the CNFH Science Panel will be addressed in the CNFH AMP. A few measures recommended by the CNFH Science Panel are addressed in the Focus Studies section of the AMP, but these are relatively obscure in the many pages of the proposal and AMP. Uncertainties related to hatchery operation and fisheries management should be identified *prior* to the preparation of a proposal to fund the development of the portion of the AMP associated with the CNFH.

The AMP provides a framework for decision-making after the implementation of the project. The AMP proposes leadership and processes that have potential to be insular and limited by interdisciplinary expertise within the Adaptive Management Plan Technical Team (AMPTT). None of the processes identified as part of the project implementation or adaptive management include the role of scientific peer review. Decision makers are more likely to make full use of the information collected via the AMP if they are confident that the products have passed rigorous peer review.

The proposal does not provide a critical element required for future decision making—criteria or a conceptual framework for selecting among actions that differently benefit or impose a cost to “competing” species (e.g., spring Chinook salmon versus steelhead; fall run Chinook salmon versus spring run Chinook salmon; salmon versus frogs or chats). Nor does the proposal provide a decision-making process for weighting benefits for salmon and steelhead versus ecosystem structure and function. At some point in the future, the Battle Creek restoration team will need to choose between actions that may benefit one species while reducing the abundance of another, or between the benefits of a large artificial propagation program at CNFH versus the restoration of naturally reproducing populations in Battle Creek. The JBCRP encourages the Project Team to develop this framework now, before the decisions are made more difficult by political and policy debate.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

The Battle Creek Restoration Plan as defined at this time should be very effective in meeting the objectives for enhancing fish passage throughout the watershed. Modifications by the design team have rectified issues with the fish screens on North Battle Creek and Eagle Canyon facilities. Sediment monitoring following the removal of

diversion structures has been addressed satisfactorily and information should be obtained that will be transferable to other systems for application. The proposed (focused) studies of habitat use by juvenile salmonids are needed. They should be explicitly designed to provide an adequate basis for evaluating rearing capacity of habitat. Juvenile studies should also be carried out on a more limited basis as a long-term monitoring program. Particularly useful information could be gained regarding juvenile use of cold water habitat, the distribution of cold water refugia, and sediment dynamics associated with dam removal.

4. **Feasibility.** Is the approach fully documented and technically feasible? Does it include appropriate data analysis? What is the likelihood of success?

The proposed physical modifications to dams and intake structures and other measures designed to redirect and/or restore more natural flows to the Battle Creek system are feasible strategies that have a high probability of improving fish passage and expanding and improving instream habitat for spawning and rearing of anadromous fish. The project proposal reflects substantial review by the Technical Review Panel and many modifications of an earlier proposal in response to these comments.

Feasibility of achieving the primary biological objectives of proposed project activities ("restore and recover the assemblage of anadromous salmonids …") is impossible to judge at this time for three reasons. First, as pointed out under **Goals** (Item #1, above), the interim quantitative goals of 1000 adult spawners for each species is not tied to available habitat (note that Project personnel have begun initial estimates of possible abundances that could be supported by available habitat, and these efforts should be continued and strengthened). Second, as noted under **Approach** (Item #3, above); the proposal has not used a quantitative life cycle model to argue that self-sustaining populations of various species could become established in a restored Battle Creek. Determination of whether or not self-sustaining restored populations could exist in Battle Creek requires a quantitative consideration of current or conjectured future spawning and rearing conditions in Battle Creek itself; outmigration conditions in the mainstem Sacramento River, in the Delta and in the estuary; ocean conditions that affect survival as fish enter salt water; fishery harvest rates in ocean and freshwater fisheries; and in river conditions for upstream passage in the Sacramento River and in Battle Creek. Although such life cycle modeling would be largely theoretical and there would likely be substantial uncertainty in many of the estimated parameter values required for modeling, this approach could provide important insights regarding feasibility of restoration. Life cycle modeling could also identify additional uncertainties that need to be addressed in the AMP.

Third, the proposal does not clearly identify restoration strategies. Various modifications to dams and improvements in fish passage have apparently contributed to increased abundance of spring Chinook in Butte Creek, an east side Sacramento River tributary about 50 miles south of Battle Creek. Butte Creek is in part distinguished from Battle Creek by the fact that a modest spring Chinook run (about 1,000 spawners) existed prior to the fish passage improvements. In Battle Creek, only remnant runs of presumptive spring Chinook and "natural" steelhead are believed to exist (about 50-400 spawners per year) and there is little or no evidence of an existing winter-run Chinook salmon run. Under these circumstances, feasibility of restoration depends not just on habitat improvements but also on strategies for reintroduction. The Battle Creek restoration project itself provides no reintroduction strategies for winter or spring run Chinook

salmon (see **Approach**, above). However, restoration strategies are apparently being developed by the Technical Recovery Team for the Central Valley. The USFWS proposal for restoration of steelhead has been developed independently of the Battle Creek Restoration Plan and has been implemented. It is critically important that reintroduction strategies receive thorough attention as they may prove key to the speed with which restoration occurs and to the project's long-term success

5. **Capabilities.** Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Although the individual members of the project team are not clearly identified in the proposal, the constituent agencies have many qualified staff who can efficiently and effectively implement the proposed project. We are concerned, however, by three potential problems. First, the proposal's inadequate response to some review panel comments suggests that the project lacks a modeler with experience in salmonid population dynamics, fish-habitat relations, and viability analysis. Such a modeler is needed to build and analyze a full life cycle model, which was requested in the reviews by both Panels. We do not believe that it is adequate to rely on modeling efforts and experts outside the framework of the restoration program.

Second, it is not clear that the USFWS geneticists (in particular, Don Campton) will remain involved with the Battle Creek project if it does not rely on supplementation with fish from CNFH. A geneticist is an essential component of the restoration team because of the many genetic issues raised by the project and the opportunities for gaining important genetic knowledge from this effort. We recommend that a qualified geneticist be added as a full-time investigator associated with the restoration plan's reintroduction policies and in tracking the success of the restoration plan in achieving its objectives of restoring viable populations of at least the three priority species to Battle Creek.

Third, we believe that successful restoration in Battle Creek will require that a science leader or principal investigator for the inter-agency AMPTT be designated and assigned responsibility for day-to-day oversight and coordination of implementation and monitoring for the duration of the project. The current structure of the AMPTT does not appear to call for any individual to serve in such a long-term leadership position, but we believe that a team leader is essential.

6. **Cost/Benefit Comments.** Are the costs for each of the features described in the project documents reasonable and justified? Is funding for monitoring adequate to measure success of the project?

The JBCRP does not feel that it can provide adequate comments on the topic of cost/benefit of the Battle Creek Restoration Plan. First, ecological benefits that might result from the Project have not been quantified and no economic measures of restoration values have been presented. At the very least, calculation of hypothetical project benefits would require estimates of the probable sizes of future restored populations of anadromous salmonids, the area and type of restored habitats, and the associated economic values of fish and habitat.

Costs for other individual project activities did not generate substantial concerns, but the JBCRP did not focus on individual costs in its review. In some instances, when we could identify costs associated with specified construction activities they did appear to be reasonable. Furthermore, we recognize that the Agencies responded to specific comments early in the review process and some budget line items increased and some line items decreased as a result of suggested changes. We encourage CBDA to rigorously review the budget and identify possible cost savings.

7. **Amendment comments:** How does this proposal respond to the Technical Panel Report? Have major areas of concern been addressed? Are the appropriate sections of the CHFH Science Report adequately addressed?

The current proposal responds satisfactorily to many issues that were raised by the Technical Review Panel. Many design changes are described in detail under the section "Budget Justification for each Restoration Project Feature". The inclusion of adult salmon monitoring equipment in construction design and costs is prudent. The project team has negotiated reduced mitigation costs, increased AMP funding levels, and prepared a more detailed AMP. The proposal is also responsive to comments on the importance of learning about coldwater habitats on microhabitat and stream scales and the consequences of dam removal on sediment movements.

However, the project team has not fully responded to concerns identified in the Technical Review Panel's report regarding stock priority, the non-quantitative aspects of viable populations, and criteria for each life stage. The proposal now identifies steelhead, and winter and spring Chinook salmon as having higher restoration priority than fall and late-fall Chinook salmon (which is an important improvement) but uses NOAA Viability standards as a proxy for interim quantitative escapement goals instead of habitat suitability (which is not a satisfactory improvement).

We continue to believe that development of a full life cycle model would provide a critical framework for the restoration program. This model could be used to make a preliminary quantitative determination of whether or not sustainable populations of target species could be (re)established in Battle Creek. The model would provide a framework for integrating the wide array of information that will be collected during and after the project implementation. We also believe that there is still a critical need for the proposal to present recommended strategies for reintroduction of anadromous salmonids in Battle Creek, with special attention given to the primary species of interest (winter and spring run Chinook salmon and steelhead). Finally, we have many concerns regarding research priorities and research methods to be used in monitoring programs after the dam removal phase has been completed. We address this final concern in greater detail below.

Additional Comments:

We wish to emphasize our belief that the restoration program, when fully implemented, would make a valuable contribution to regional conservation and would produce substantial improvements in physical habitat quality and quantity within Battle Creek. Post-project information derived from monitoring cold water habitat and sediment dynamics following dam removal will be valuable. The project team responded positively

to Technical Review Panel's suggestions and made important improvements to the AMP, but the response to CNFH Science Panel's recommendations was deficient.

Overall, the proposal suffers from a lack of consensus and coordination among the various institutions and stakeholders who have roles or interests in the restoration program. The multi-agency restoration program lacks a "project leader" and we are concerned that dedicated expertise is lacking in key technical areas including population dynamics modeling and genetics.

The most serious deficiencies of the current proposal and AMP include the continuing failure to produce a comprehensive proposal document, and the lack of habitat-based quantitative recovery goals and associated analyses supporting attainability of those goals. In addition, the proposal still does not consider reintroduction strategies and it remains ambiguous with respect to whether restoration objectives will or will not include fall and late-fall Chinook salmon and how achievement of restoration goals for various species/runs may compete with one another (e.g., competition among juveniles for rearing habitat).

Potential Conditions For Funding

Although we believe that the CBDA should give conditional approval to this important restoration project so that dam removals and development of fish passage structures can be accomplished over the next three years, we believe that this approval should be conditioned upon the following modifications of the proposal. Note that these topics do not include facility design or construction activities that make up a large portion of the budget of the Project.

1. **Summary Document:** The project proponents must produce a summary document, no longer than 100 pages in length, that identifies the most critical objectives and issues raised by the project and that provides a clear and detailed guide to the topics considered in the myriad of documents that together constitute the "Battle Creek Restoration Plan". After months and months of review of Battle Creek documents, we remain concerned that it is nearly impossible to "find the plan" and that it may be critical for the complete plan to be clearly identifiable in the future. We believe that this document should be developed before project funding is approved.

2. **Fisheries Management Policy for Battle Creek:** Progress in implementing the Battle Creek Project by the CBDA should be accompanied by progress toward a well-defined fisheries management plan for Battle Creek. The Battle Creek Project is not accompanied by a fisheries management plan. The Agencies may argue that Battle Creek is one of many tributaries in larger management plans that emphasize salmonids. The Panel recognizes the important role the NMFS Proposed Recovery Plan for the Sacramento River winter-run Chinook salmon has played in the planning process. However the document is fairly dated (1997) and future documents related to salmon in preparation by NOAA Fisheries appear to be about 18 months to 2 years out. We are pleased to see the efforts of the Greater Battle Creek Working Group with the Preliminary Administrative Draft Battle Creek Winter-run Chinook Salmon Feasibility Analysis. The Greater Battle Creek Working Group recognizes the value of quantitative estimates of

adult salmon spawner abundance necessary to achieve genetically viable population levels, but defers to the NOAA Fisheries Technical Review Team for such quantitative estimates.

The efforts to restore salmon and steelhead in Battle Creek, the post construction monitoring for the Battle Creek Project, and the operations of Coleman NFH have a common goal. However, within these three major activities are many competing priorities that will have to be addressed by fisheries managers. We recognize that much progress has occurred in the past several years. For example, improvements of the Coleman NFH weir will provide for better salmon management on a run-specific basis. Furthermore, changes in steelhead management may be an improvement that will be supportive of restoration. On the other hand, many questions remain. What will be the reintroduction strategy for winter-run Chinook salmon? Will superimposition or hybridization between salmon runs be problematic and if so what can be done to avoid the problems? Will the quantitative estimates prepared by NOAA Fisheries provide significantly more guidance that the estimate of 1,000 spawners developed using IFIM and gravel surveys? What will the allowable fisheries harvest policies be in a restored Battle Creek? What are the expectations for resident salmonids as well as other resident fishes? Because of the substantial cost and timeline for construction (only 3 years) of the Battle Creek Project, we believe CBDA should encourage the Agencies to seek consensus on reintroduction and fish management strategies.

3. **Reintroduction Strategies:** We believe that it is absolutely critical that the issue of reintroduction strategies is addressed now so that full consideration will be given to the best methods for restoration of the three priority species: winter and spring Chinook salmon and steelhead. Although considerable thought and progress has been made regarding steelhead restoration, and CNFH policies have fully responded to our recommendations regarding steelhead reintroduction, the project team has not yet developed reintroduction strategies for winter or spring Chinook salmon. When the Central Valley Technical Recovery Team releases its proposed restoration strategies for spring and winter run Chinook salmon, it will be critical for the AMTT to review these proposed strategies and determine how best to tailor them to Battle Creek. We believe a condition of approval of the restoration plan should be that a supplementary document on reintroduction strategies should be submitted no later than June 2007.

4. **Project Staffing:** Restoration plan documents at many points suggest to us that the project team has suffered from a deficiency of expertise in population dynamics modeling and genetics. The Agencies should ensure that arrangements are made to provide the AMPTT adequate expertise on population dynamics modeling and genetics. The arrangements could be in the form of additional agency staff, contracts with universities for faculty and students, working groups, consulting experts, or contracts for deliverables. We believe that substantial expertise in each of these areas should be dedicated to the restoration program.

5. **Monitoring:** Previous reviews have identified the importance of developing a full life-cycle model for the major target species—winter-run Chinook salmon, steelhead, and spring Chinook. The proposal does not include modeling or

request funds for either developing new models or applying existing models. The proposal indicates that such models are being used by other groups in the Sacramento River basin and implies that application of such models in Battle Creek Project is unnecessary. The review panel thinks that the Project Team has misinterpreted the purpose of the modeling efforts we recommended. Sooner or later, the Project will be expected to demonstrate the degree of success of the Project and will be expected to explain what happened to the channels, habitats, thermal environments, and fish populations in Battle Creek. This makes the choice of appropriate monitoring components and timing of measurements extremely critical. Responses observed in Battle Creek may be amplified, dampened, or obscured by other processes or by conditions and processes outside of Battle Creek.

A life-cycle model (and associated geomorphic and temperature models) integrates the known relationships, observed conditions, abundances at different life stages, and effects of biotic interactions. The Project Team can use the model to 1) prioritize monitoring measurements to address the most sensitive characteristics of the populations and most influential processes, 2) evaluate the consistency of different measures of the populations, 3) evaluate the potential effects of processes and events outside of Battle Creek on adult salmon returns, and 4) directly relate dynamics within Battle Creek to returns of adult salmon. The purpose of modeling is to create a framework for understanding the observed responses in Battle Creek. The modeling is not intended to produce predictions of future salmon abundance. It is a method for integrating the complex array of measurements and better understanding future changes in the salmon populations and habitats in Battle Creek.

6. **Timely reporting and open access to documents:** The current monitoring program has produced reports on their findings sporadically. Results of each year's measurements in Battle Creek over the last 5-10 years are not available. Reports on monitoring activities should be prepared on an annual basis consistent with the AMP timelines, should be peer reviewed, and should be made available to the public both from a public agency and on the Internet.

   The Adaptive Management Plan invites public involvement in the Battle Creek Project and outlines the dissemination of data and information to the public. This approach will require timely reporting by the Agencies conducting the monitoring activities to enable some adaptive management evaluations on an annual basis. Collecting and analyzing the data for agency use and decision making each year is not adequate. It is imperative that annual progress reports are prepared, peer reviewed, and released in a timely manner on an annual basis. Experience by the JBCRP during this review and on other projects leads us to believe that strictly adhering to timelines will make the best use of the available funds for monitoring and maximize the benefit to the restoration project. Furthermore, this should be enforced through explicit contracting procedures put in place by CBDA.

   We also encourage CBDA to require agencies responsible for monitoring to conduct a peer review of annual technical reports. Some federal agencies now require this peer review. We recommend that if necessary, funding for independent peer review be included in the cost of the preparation of the report. Finally, the annual report should be made available to the public both from a

public agency and on the Internet. These important steps in the preparation of the reports will require a concerted effort by the investigators to complete the reports on time, but it will maximize the benefits from restoration project and monitoring activities.

7. **Outreach and Workshops:** The Battle Creek Project is one of the biggest secrets in restoration ecology and fisheries management. It is one of the major plans for removing dams and restoring coldwater habitats in North America, yet few outside of the Sacramento River basin and central California know of its existence. In addition to the obvious lack of recognition for the enormous efforts going into this project, this lack of outreach may cause the Project to miss opportunities to attract scientists to take advantage of this major restoration effort and miss possible funding sources for measurements after implementation of the project.

   The Review Panel strongly recommends CBDA to quickly and actively devote efforts to have scientists present the plans for Battle Creek Projects at national meetings for major professional societies, such as the American Fisheries Society, Ecological Society of America, Society of Conservation Biology, Society for Ecological Restoration, American Geophysical Union, American Water Resources Association, and others. This is one of the largest projects anticipated for the CBDA and the public and natural resource management community should know about it and learn from its outcomes.

   In addition to actively presenting the project plans and results to national meetings, we recommend CBDA to require two major workshops—one at 12-18 months and one at 3-5 years from project initiation. The primary purpose of the first workshop would be developing detailed plans for project monitoring and to begin exploration of possible sources of funding for on-going monitoring beyond the existing CBDA limits. The purpose of the second workshop would be to present restoration findings to date and to evaluate the performance of methods used to monitor restoration. Based on this workshop, further improvements in monitoring methods would emerge.

8. **Budget Review:** We recommend that CBDA implement appropriate fiscal review of the project budget and consider detailed cost and performance audits as the project is implemented. During the review, the JBCRP found no evidence of unreasonable costs. However, the line item costs were often in millions of dollars and additional details on budget line items were not requested by JBCRP. Although some JBCRP members are familiar with design and construction costs and others with the costs of large research programs, we did not consider ourselves expert in cost analysis. The Project involves both federal (BOR) and state (CALFED) agencies with such expertise. Furthermore, our experience is that as a federal agency (BOR) the project activities may be subject to rigorous audits by private sector financial auditors. Other entities such as The Bonneville Power Administration in the Northwest have Fish and Wildlife Program budgets exceeding $100 million per year and they fund numerous habitat improvement projects with very detailed cost accounting (e.g., Equipment Rental requires a description of what was rented, dates or hours of rental, and rental rates and whether rates include operator). Because of the large size, the high profile of the Battle Creek Project, and the numerous interested parties, we encourage a

proactive position on fiscal management of the Project that is not evident at this time.

9. **What Happens After 7 Years:** The civil works or construction phase of the Battle Creek Restoration Project (Project) is scheduled to begin in 2006, and completed in 2009. The funding requested for the Anadromous Fish Monitoring in the Project proposal will be utilized to establish baseline conditions for the Project. After 2009, no funds appear to be available to provide for post-construction aspects of the Fish Monitoring Program or the Adaptive Management Program. Both programs are critical to realize the benefits of the investment being made in civil works and to provide the best opportunity for the success of the overall Battle Creek restoration effort. The JBCRP understands the budgetary process of both Federal and State governments and the funding cycle of CALFED and that there are no "guarantees," but participating agencies need to make a firm commitment to support long-term on-going monitoring studies in Battle Creek, whether future CBDA funding is available or not.

   Finally, we reiterate our belief that the Battle Creek Restoration Project needs long-term leadership with a passion, desire, and support to oversee the work and maximize the awareness of the Project among the public, political, and scientific communities, as mentioned under Item 7 above. Such leadership will be essential to provide the best opportunity for funding the monitoring and adaptive management work after construction is completed in 2009.

APPENDIX

References Used by Reviewers

Anderson, C. K., K. Dossey, S. Kennedy, and B. McLaughlin. 2000. Battle Creek Salmon and Steelhead Restoration Project fish ladder and fish screen features: Inskip Diversion, North Battle Creek Feeder Diversion, Eagle Canyon Diversion; preliminary engineering concepts technical report. State of California, the Resources Agency, Department of Water Resources, Division of Planning and Local Assistance, Sacramento, California.

Bartholow, J. M. 2002. Modeling uncertainty: quicksand for water temperature modeling. U.S. Geological Survey presentation, Fort Collins, Colorado.

Bartholow, J. M., J. L. Laake, C. B. Stalnaker, and S. C. Williamson. 1993. A salmonid population model with emphasis on habitat limitations. Rivers 4(4):265-279.

Battle Creek Project Management Team. 2004. Final response to March 2004 Technical Review Panel comments on the January 2004 initial response to the September 2003 Technical Review Panel report (May 2004).

Brown, M. R. and J. M. Newton. 2002. Monitoring adult Chinook salmon, rainbow trout, and steelhead in Battle Creek, California, from March through October 2001. U.S. Fish and Wildlife Service report, Red Bluff, California.

Brown, R., and W. Kimmerer. 2004. A summary of the October 2003 Battle Creek Workshop. Summary report for California Bay-Delta Authority Science and Ecosystem Restoration Programs.

Busack, C., D. Hankin, R. P. Hedrick, J. A. Lichatowich, and R. Reisenbichler. 2004. Compatibility of Coleman National Fish Hatchery operations and restoration of anadromous salmonids in Battle Creek. Report of Technical Review Panel for Battle Creek Working Group, Red Bluff, California.

California Hydropower Reform Coalition. 2004. Analysis of dam removal alternative B Battle Creek Salmon and Steelhead Restoration Project. CHRC report, Berkeley, California.

California State Water Resources Control Board, U.S. Department of the Interior, Bureau of Reclamation, Federal Energy Regulatory Commission Department of Energy, and California Bay-Delta Authority. 2003. Battle Creek Salmon and Steelhead Restoration Project draft environmental impact statement/ environmental impact report. California State Water Resources Control Board, U.S. Department of the Interior, Bureau of Reclamation, Report J&S 03-035, Sacramento, California.

Campton, D. E., B. Ardren, S. Hamelberg, and D. Niemela. 2003. Genetic monitoring plan for hatchery and natural origin steelhead in Battle Creek, California. U.S. Fish and Wildlife Service, Abernathy Fish Technology Center, Coleman National Fish Hatchery, and Red Bluff Fish and Wildlife Office, presentation for Battle Creek Workshop, Red Bluff, California.

Campton, D. E., W. R. Ardren, and J. D. Baumsteiger. 2003. Genetic comparisons between hatchery and natural origin steelhead trapped at the Coleman NFH, 2002-2003. U.S. Fish and Wildlife Service and Abernathy Fish Technology Center, presentation for Battle Creek Workshop, Red Bluff, California.

Coleman National Fish Hatchery. 2003. Barrier weir and associated fish ladders. Presentation for Battle Creek Workshop, Red Bluff, California.

Cox, W. T. 2003. Disease transmission, management and preventative measures. California Department of Fish and Game, presentation for Battle Creek Workshop, Red Bluff, California.

Creek, K. D., S. Tu. 2001. Stream temperature model for the Battle Creek Salmon and Steelhead Restoration Project. Land and Water Quality Unit, Report No.:026.11-00.256 for Technical and Ecological Services.

ERP (Ecosystem Restoration Program). 2004. Further biological analyses for information presented on March 15, regarding the differences between the 5 dam removal alternative and the 8 dam removal scenario. ERP, draft for review by the Technical Review Panel.

Foott, J. S. 2003. Anadromous fish pathogens in the Central Valley and Battle Creek. U.S. Fish and Wildlife Service, presentation for Battle Creek Workshop, Red Bluff, California.

Gallo, K., C. Moyer, and S. Lanigan. 2001. Interagency regional monitoring northwest forest plan aquatic and riparian effectiveness-monitoring program; 2001 pilot summary report. Aquatic and Riparian Effectiveness-Monitoring Core Team, USDA Forest Service Pacific Northwest Regional Office, and Bureau of Land Management Oregon State Office, interagency report.

Greater Battle Creek Working Group. 2005. Preliminary administrative draft Battle Creek winter-run Chinook salmon feasibility analysis. GBCWG, Draft 5/05, Sausalito, California.

Hoye, W. 2003. California Bay-Delta Authority, Science Program. Metropolitan Water District of Southern California. Battle Creek Workshop, Red Bluff, California.

Keith, J. 2003. Coleman National Fish Hatchery barrier weir and fishway (CALFED action #99-B08); Concept study report supplement. A Technical Service Center report for U.S. Department of the Interior, Bureau of Reclamation.

Marshall, M. 2004. Battle Creek Salmon and Steelhead Restoration Project proposal. U. S. Bureau of Reclamation, Sacramento, California.

Mefford, B. W., A. McDaniel, and J. Wager. 2002. Coleman National Fish Hatchery barrier weir; Preliminary concept study report. A Technical Service Center report for U.S. Department of the Interior, Bureau of Reclamation.

Nielsen, J. L., S. Pavey, T. Wiacek, G. K. Sage, and I. Williams. 2003. Genetic analyses of Central Valley Trout populations, 1999-2003. USGS Alaska Science Center, Battle Creek Workshop, Red Bluff, California.

NMFS (National Marine Fisheries Service). 1997. NMFS proposed recovery plan for the Sacramento River winter-run Chinook salmon. NMFS, report, Southwest Region, Long Beach, California.

Null, R. E. and K. S. Niemela. 2003. Recent status and origin of Chinook salmon and steelhead in Battle Creek and the upper Sacramento River. U.S. Fish and Wildlife Service and Red Bluff Fish and Wildlife Office, presentation for Battle Creek Workshop, Red Bluff, California.

PG&E (Pacific Gas and Electric Company). 2003. Battle Creek Hydroelectric Project (FERC No. 1121). PG&E, license amendment application, San Francisco, California.

PMT (Project Management Team) and AMT (Adaptive Management Team). 2004. Battle Creek Salmon and Steelhead Restoration Project; Initial response to the Technical Review Panel Report. PMT and AMT, response for California Bay-Delta Authority Ecosystem Restoration Program Technical Review Panel.

Reynolds, F. L., T. J. Mills, R. Benthin, A. Low, and T. Farley. 1993. Restoring Central Valley streams: a plan for action. California Department of Fish and Game, Sacramento, California.

Roberts, M. 2004. A comparison of the preferred alternative (five dam removal) for the Battle Creek Salmon and Steelhead Restoration Project and alternative B (eight dam removal) with respect to sediment transport. Report by The Nature Conservancy, Chico, California.

Technical Panel. 2003. Technical Review Panel Report; Battle Creek Salmon and Steelhead Restoration Project. Report of Technical Panel for the California Bay-Delta Authority Ecosystem Restoration Program.

Technical Service Center. 2001. Conceptual design report; dam removals and hydropower facility modifications, Battle Creek Salmon and Steelhead Restoration Project, California. Report for U.S. Department of the Interior, Bureau of Reclamation, Denver, Colorado.

Terraqua Inc. 2002. Battle Creek Watershed assessment. Battle Creek Watershed Conservancy, Manton, California.

Terraqua Inc. 2003. Draft for CNFH Science Panel: Battle Creek Watershed assessment. Draft by Terraqua Inc. for Battle Creek Watershed Conservancy, Manton, California.

Terraqua Inc. 2004. Draft Battle Creek Salmon and Steelhead Restoration Project adaptive management plan. Prepared for U.S. Bureau of Reclamation, Pacific Gas and Electric Company, National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Game, Wauconda, Washington.

Terraqua Inc. and Kvam Aquatic Sciences. 2003. Characterization of aquatic macroinvertebrate communities in Battle Creek in 2001 and 2002 to support

watershed assessment and future monitoring. Battle Creek Watershed Conservancy, Manton, California.

U.S. Fish and Wildlife Service and California Department of Fish and Game. 2003. Evaluation of the winter-run Chinook salmon supplementation program at the Livingston Stone National Fish Hatchery using the Sacramento River carcass survey. Presentation for Battle Creek Workshop, Red Bluff, California.

U.S. Fish and Wildlife Service, Red Bluff Fish and Wildlife Office. 2001. Biological assessment of artificial propagation at Coleman National Fish Hatchery and Livingston National Fish Hatchery: program description and incidental take of Chinook salmon and steelhead trout. Report for National Marine Fisheries Service, Red Bluff, California.

U.S. Fish and Wildlife Service. 1998. Effect of temperature on early-life survival of Sacramento River fall- and winter-run Chinook salmon. U.S. Fish and Wildlife Service Report, Northern Central Valley Fish and Wildlife Office, Red Bluff, California.

U.S. Fish and Wildlife Service. 2001. Final restoration plan for the anadromous fish restoration program; a plan to increase natural production of anadromous fish in the Central Valley of California. USFWS report with assistance from the Anadromous Fish Restoration Program Core Group for the Secretary of the Interior.

Ward, M. 2003. A conversation about restoration alternatives pertaining to Coleman National Fish Hatchery. Terraqua Inc. presentation for Battle Creek Watershed Conservancy, Battle Creek Workshop, Red Bluff, California.

Ward, M. and W. M. Kier. 1999. Battle Creek salmon and steelhead restoration plan. Kier Associates report for the Battle Creek Working Group, Sausalito, California.