

Contents

- 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 To Memorialize the Agreement Regarding the Proposed Battle Creek Chinook Salmon and Steelhead Restoration Project, Located in the Battle Creek Watershed in Tehama and Shasta Counties, California.**
- Appendix B Documentation Associated with the Interim Flow Agreement**
- Appendix C Documentation Associated with the Greater Battle Creek Working Group**
- Appendix D Draft Battle Creek Salmon and Steelhead Restoration Project Adaptive Management Plan**
- Appendix E Pacific Gas and Electric Company Vested Water Rights on Battle Creek and Battle Creek Tributaries**
- Appendix F DRAFT—Habitat Assessment Model for Chinook Salmon and Steelhead**
- Appendix G Methodologies**
- Appendix H Special-Status Species Requests to California Department of Fish and Game, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Response from U.S. Fish and Wildlife Service**
- Appendix I Common and Scientific Names for Plant and Wildlife Species Mentioned in the Battle Creek Salmon and Steelhead Restoration Project Environmental Impact Statement/Environmental Impact Report**
- Appendix J Special-Status Wildlife Descriptions**

- Appendix K** Development and Assumptions of the Battle Creek Hydrology and Hydroelectric Power Model
- Appendix L** Results from Monthly Flow and Power Generation Model
- Appendix M** Instream Flow Effects on Water Temperature in the Battle Creek Restoration Area
- Appendix N** Historical Battle Creek Water Quality Data
- Appendix O** Shasta and Tehama County Production Statistics and Field Notes from Site Visit to Mount Lassen Trout Farms, Inc.
- Appendix P** Memorandum of Agreement Among the Bureau of Reclamation, the Federal Energy Regulatory Commission, and the California State Historic Preservation Officer Regarding Cultural Resources Within the Battle Creek Salmon and Steelhead Restoration Project, Shasta and Tehama Counties, California
- Appendix Q** DRAFT Fish and Wildlife Coordination Act Report

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**

MEMORANDUM OF UNDERSTANDING

by and among

NATIONAL MARINE FISHERIES SERVICE

U.S. BUREAU OF RECLAMATION

U.S. FISH AND WILDLIFE SERVICE

CALIFORNIA DEPARTMENT OF FISH AND GAME and

PACIFIC GAS AND ELECTRIC COMPANY

TO MEMORIALIZE THE AGREEMENT REGARDING THE PROPOSED BATTLE CREEK CHINOOK SALMON AND STEELHEAD RESTORATION PROJECT, LOCATED IN THE BATTLE CREEK WATERSHED IN TEHAMA AND SHASTA COUNTIES, CALIFORNIA.

This Memorandum of Understanding (MOU), by and among the NATIONAL MARINE FISHERIES SERVICE (NMFS), UNITED STATES BUREAU OF RECLAMATION (USBR), UNITED STATES FISH AND WILDLIFE SERVICE (USFWS), CALIFORNIA DEPARTMENT OF FISH AND GAME (CDFG), and PACIFIC GAS AND ELECTRIC COMPANY (PG&E), hereinafter collectively called the “Parties,” defines the Parties’ roles and responsibilities regarding actions that will be undertaken as part of the proposed Battle Creek Chinook Salmon and Steelhead Restoration Project (Restoration Project) and commitments regarding costs for and implementation of the Restoration Project.

TABLE OF CONTENTS

1.0	RECITALS
2.0	DEFINITIONS
3.0	PURPOSES
4.0	PROPOSED BATTLE CREEK CHINOOK SALMON AND STEELHEAD RESTORATION PROJECT
5.0	CONTINGENCIES AND LIMITATIONS
6.0	ROLES AND RESPONSIBILITIES
7.0	MONITORING AND REPORTING
8.0	PLANNING, PERMITTING, AND CONSTRUCTION ACTIVITIES
9.0	ADAPTIVE MANAGEMENT
10.0	FUNDING
11.0	LEASES OR SALE OF FERC PROJECT NO. 1121
12.0	ENVIRONMENTAL LIABILITIES
13.0	AMENDMENT PROCESS
14.0	DISPUTE RESOLUTION
15.0	TERM
16.0	TERMINATION
17.0	SIGNATURES

1.0 RECITALS

This MOU is entered into with the following understandings:

- 1.1** Battle Creek is a tributary of the Sacramento River located in Tehama and Shasta Counties. This cold, spring-fed stream has exceptionally high flows during the dry season, making it important habitat for anadromous fish. Battle Creek may be the only remaining stream other than the main stem of the Sacramento River that can successfully sustain breeding populations of steelhead and all four runs of chinook salmon. Battle Creek is also unique and biologically important because it provides habitat opportunities during drought years for winter-run chinook salmon.
- 1.2** PG&E owns and operates several diversion facilities on the North and South Forks of Battle Creek, including Coleman Diversion Dam, Inskip Diversion Dam, South Diversion Dam, Wildcat Diversion Dam, Eagle Canyon Diversion Dam, and North Battle Creek Feeder Diversion Dam, and dams on Ripley Creek, Soap Creek and Baldwin Creek, and controls the majority of the flows in the anadromous fish reaches of the Battle Creek watershed.
- 1.3** In 1997, in response to opportunities to apply for federal and state fish and wildlife resource restoration funds, the Battle Creek Working Group (BCWG), made up of representatives from the state and federal resource agencies and fishery, environmental, local, agricultural, power, and urban stakeholder communities, was formed to accelerate chinook salmon and steelhead restoration in the Battle Creek watershed. The BCWG provided technical advice for a plan developed under a CALFED Category III grant.
- 1.4** By participating in a cooperative process to restore Battle Creek, which avoids the conventional, adversarial, regulatory process, the Parties expect to realize the following benefits:
 - A.** Restoration of self-sustaining populations of chinook salmon and steelhead and their habitat in the Battle Creek watershed through a voluntary partnership with state and federal agencies, a third party donor(s), and PG&E;

- B.** Up-front certainty regarding specific restoration components, including Resource Agency prescribed instream flow releases, selected decommissioning of dams at key locations in the watershed, dedication of water diversion rights for instream purposes at decommissioned sites, construction of tailrace connectors, and installation of Fail-Safe Fish Screens and Fish Ladders;
 - C.** Timely implementation and completion of restoration activities; and
 - D.** Joint development and implementation of a long-term Adaptive Management Plan with dedicated funding sources to ensure the continued success of restoration efforts under this partnership.
- 1.5** A negotiating team comprised of management representatives from CDFG, NMFS, PG&E, USBR, and USFWS, met in the fall of 1998 and in early 1999 to pursue an agreement regarding a proposal for Battle Creek restoration actions. An Agreement in Principle among the Parties was entered into in February, 1999 (see Attachment 1).
- 1.6** Other actions to restore and enhance fish habitat are being implemented in the Battle Creek watershed that are not directly related to hydroelectric project operations (e.g., Coleman National Fish Hatchery actions and meadow restoration upstream of the natural barrier falls which preclude anadromous passage). These actions are outside the scope of the Restoration Project, but are considered important to the overall success of restoring anadromous fishery resources in the Battle Creek watershed.
- 1.7** Implementation of the Restoration Project will be consistent with the following restoration directives and programs:
 - Central Valley Project Improvement Act (Public Law 102-575 Section 3401 et seq. (CVPIA)) Anadromous Fish Restoration Program;

- State Salmon, Steelhead Trout, and Anadromous Fisheries Program Act (State Senate Bill 2261, 1990) Central Valley Salmon and Steelhead Restoration and Enhancement Plan;
- National Marine Fisheries Service Recovery Plan for Sacramento River Winter-run Chinook Salmon;
- CALFED Ecosystem Restoration Program;
- Upper Sacramento River Fisheries and Riparian Habitat Management Plan (State Senate Bill 1086, 1989);
- Restoring Central Valley Streams – A Plan for Action (1993); and
- Steelhead Restoration and Management Plan for California (1996).

One specific goal of both the CVPIA and State Senate Bill 2261 is doubling natural production of anadromous fish. Battle Creek has been identified as one of the Sacramento River tributaries where restoration activities have the potential to contribute materially to these goals.

1.8 The Parties are proposing a series of measures, described in this MOU as the Restoration Project, to establish a restoration program for chinook salmon and steelhead habitat in the reaches of Battle Creek below the natural water falls on the forks of Battle Creek that act as absolute barriers to fish passage (see Section 2.19). The Total Project Cost of the Restoration Project is estimated to be \$50,709,000. Individual restoration actions under the Restoration Project will be based upon the best scientific and commercial information available. The Parties intend to implement the Restoration Project in the most efficient and cost effective manner consistent with achieving the benefits and goals articulated in Sections 1.4 and 1.7.

1.9 The Parties recognize the unique characteristics of Battle Creek regarding its importance in the restoration of chinook salmon and steelhead in the Sacramento River watershed. The Parties also acknowledge the current availability of public funding for anadromous fish restoration projects in

the Central Valley, which funding has not been readily available in the past and may not be in the future. Based on this unique set of circumstances, the Parties recognize that all actions cooperatively pursued under the Restoration Project, including dam removal and public funding, will not set a precedent for future restoration actions in other watersheds.

- 1.10** USFWS is participating in the Restoration Project pursuant to the CVPIA, the Endangered Species Act (16 U.S.C. Sections 1531-1544, as amended (ESA)), Fish and Wildlife Coordination Act, Federal Power Act and the Fishery Conservation and Management Act (16 U.S.C. Sections 1801-1882).
- 1.11** NMFS is participating in the Restoration Project pursuant to the ESA.
- 1.12** USBR is participating in the Restoration Project pursuant to the CVPIA and the California Bay-Delta Environmental Enhancement Act (P.L. 104-333).
- 1.13** CDFG is participating in the Restoration Project based on its responsibilities as trustee agency for the fish and wildlife resources of California (Fish and Game Code Section 711.7(a)) and its jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (Fish and Game Code Section 1802), and other applicable state and federal laws.
- 1.14** PG&E is participating in the Restoration Project as owner and operator of the Battle Creek Hydroelectric Project (Federal Energy Regulatory Commission (FERC) Project No. 1121).

THEREFORE, the Parties hereby understand and agree as follows:

2.0 DEFINITIONS

The terms “CDFG”, “CVPIA”, “ESA”, “MOU”, “NMFS”, “Parties”, “Restoration Project”, “USBR”, and “USFWS” have the meanings set forth above.

For the purposes of this MOU, the following terms have the meanings set forth below:

- 2.1** "Adaptive Management" means an approach, as more specifically described in Section 9.0, that allows for changes to the Restoration Project that may be necessary in light of new scientific information regarding the biological effectiveness of the restoration measures.
- 2.2** "Adaptive Management Fund" means the Fund described in Section 9.2 B.
- 2.3** "Agencies" means CDFG, NMFS, USBR, and USFWS.
- 2.4** "Battle Creek Hydroelectric Project, FERC Project No. 1121" or "FERC Project No. 1121" means the hydroelectric development as described in the license issued by FERC on August 13, 1976 and as subsequently amended.
- 2.5** "CALFED" means the entity formed in 1995 by the cooperative effort among state and federal agencies and California's environmental, urban, and agricultural communities to address environmental and water management problems associated with an intricate web of waterways created at the junction of the San Francisco Bay and the Sacramento and San Joaquin rivers and the watersheds that feed them and comprise CALFED's solution area for the Bay-Delta system.
- 2.6** "CAMP" means the Comprehensive Assessment and Monitoring Program which has been established pursuant to Section 3406(b)(16) of the CVPIA.
- 2.7** "Consensus" means the unanimous agreement among the Parties.
- 2.8** "CPUC" means the California Public Utilities Commission.
- 2.9** "Decommission" means to fully remove all applicable facilities and return a site to an approximation of pre-existing conditions, subject to FERC approval. Decommissioning activities include, but are not limited to, developing a decommissioning plan, performing pre- and post-removal environmental studies, facility removal, environmental mitigation and restoration, erosion control, re-vegetation, environmental monitoring, and reporting.

- 2.10** “Fail-Safe Fish Ladder” means features inherent in the design of the ladder that ensure the structure will continue to operate to facilitate the safe passage of fish under the same performance criteria as designed under anticipated possible sources of failure.
- 2.11** “Fail-Safe Fish Screen” means a fish screen that is designed to automatically shut off the water diversion whenever the fish screen fails to meet design or performance criteria until the fish screen is functioning again.
- 2.12** “FERC” means the Federal Energy Regulatory Commission, the entity charged with implementing the Federal Power Act (16 U.S.C. 791 (a) et seq.) and the licensing of non-federal hydropower projects in jurisdictional waters of the United States.
- 2.13** “Final FERC Order” means a final order issued by FERC pursuant to an application filed by PG&E to amend the license for FERC Project No. 1121 to implement the applicable measures of this Restoration Project, after exhaustion of any administrative or judicial remedy.
- 2.14** “PG&E” means the Pacific Gas and Electric Company, and any lessee or successor owner of the Battle Creek Hydroelectric Project (FERC Project No. 1121).
- 2.15** “Purchased Water Cost” means the identified financial value of the prescribed instream flow releases provided by the Restoration Project in excess of the required flows stated in the license for FERC Project No. 1121 as of March 1, 1999.
- 2.16** "Ramping Rates" means moderating the rate of change of stream stage decrease in Battle Creek resulting from the operation of FERC Project No. 1121.
- 2.17** “Resource Agencies” means CDFG, NMFS, and USFWS.
- 2.18** "Restoration Project" means all measures set forth in the underlying Agreement in Principle (Attachment 1) as further developed in this MOU and having the purpose of restoring chinook salmon and steelhead habitat

associated with FERC Project No. 1121, within the Restoration Project Area.

2.19 “Restoration Project Area” means the areas in and around the following PG&E facilities: Coleman Diversion Dam, Inskip Diversion Dam, South Diversion Dam, Wildcat Diversion Dam, Eagle Canyon Diversion Dam, North Battle Creek Feeder Diversion Dam, and Asbury Pump Diversion Dam; Battle Creek, North Fork Battle Creek and South Fork Battle Creek, up to the natural barriers at 14 miles and 19 miles above the confluence, respectively; and Eagle Canyon Springs, Soap Creek (and Bluff Springs), Baldwin Creek, and Lower Ripley Creek and each of their adjacent water bodies.

2.20 "Total Project Cost" means all costs necessary to implement the Restoration Project, including but not limited to: planning; permitting; performing environmental and decommissioning studies; preparing a FERC license amendment application; designing, constructing, operating, maintaining and making periodic replacements for various facility additions (i.e., fish screens, fish ladders, connectors and appurtenant facilities) to FERC Project No. 1121; facility decommissioning, removal, and environmental restoration; facility and biological and environmental monitoring and reporting; Purchased Water Cost; and Adaptive Management planning, monitoring, and implementation costs.

2.21 "Water Acquisition Fund" means the Fund described in Section 9.2 A.

3.0 PURPOSES

The purposes of this MOU are:

3.1 To identify the series of measures comprising the proposed Restoration Project to be addressed in the NEPA/CEQA/ESA and other applicable environmental compliance and permitting processes;

3.2 To identify the roles and responsibilities of each of the Parties;

3.3 To identify contingencies and limitations of the Parties; and

- 3.4** To identify the scope of proposed FERC license terms and conditions for preparation of a separate license amendment application to be subsequently submitted to FERC to implement the proposed Restoration Project.

4.0 PROPOSED BATTLE CREEK CHINOOK SALMON AND STEELHEAD RESTORATION PROJECT

The Parties understand and agree that all engineering and design work for facility modifications described in Section 4.1 below, including installation of fish screens and fish ladders, decommissioning dams and associated facilities, and installation of any connections between powerhouses and water conveyance facilities on the South Fork of Battle Creek, shall meet applicable CDFG, FERC, NMFS, PG&E, USBR, and USFWS standards.

The proposed Restoration Project includes the following:

4.1 Facility Modifications

A. Coleman Diversion Dam:

- Install a tailrace connector from Inskip Powerhouse to Coleman Canal and a water bypass facility around Inskip Powerhouse to Coleman Canal. The Inskip Powerhouse bypass facility will be the most economical alternative that still provides the functional equivalent of the existing Inskip Powerhouse bypass system and will deliver that system's design flow of water to the Coleman Canal.
- Decommission the dam and appurtenant facilities.

B. Inskip Diversion Dam:

- Install a NMFS/CDFG approved Fail-Safe Fish Screen.
- Install a NMFS/CDFG approved Fail-Safe Fish Ladder.
- Install a tailrace connector from South Powerhouse to Inskip Canal concurrent with, or prior to, the Inskip Diversion Dam fish screen.

- C.** South Diversion Dam:
- Decommission the dam, related water conveyance and appurtenant facilities.
- D.** Wildcat Diversion Dam:
- Decommission the dam, related water conveyance and appurtenant facilities.
- E.** Eagle Canyon Diversion Dam:
- Install a NMFS/CDFG approved Fail-Safe Fish Screen.
 - Install a NMFS/CDFG approved Fail-Safe Fish Ladder.
 - Decommission spring collection facilities as identified in Table 1 of Attachment 1.
- F.** North Battle Creek Feeder Diversion Dam:
- Install a NMFS/CDFG approved Fail-Safe Fish Screen.
 - Retrofit the existing fish ladder or install a new ladder, either which meet NMFS/CDFG approved design for Fail-Safe operation.
- G.** Soap Creek:
- Decommission the dam, related water conveyance and appurtenant facilities.
- H.** Lower Ripley Creek:
- Decommission the dam, related water conveyance and appurtenant facilities.

I. Baldwin Creek:

- Provide a means for releasing a maximum instream flow of 5 cfs from Asbury Pump Diversion.

J. Various Locations:

- Install/modify gauges at appropriate locations required to monitor implementation of the Restoration Project.

While the above list of facilities to be decommissioned shall not be reduced, the Parties may reach Consensus on less than full removal of any specific facility or appurtenant feature in order to reduce overall Restoration Project costs, where objectives of the Restoration Project, including unimpeded fish passage, will be met while at the same time minimizing PG&E liability.

4.2 Prescribed Instream Flow Releases

The Parties agree that another component of the Restoration Project is an increase of prescribed instream flow releases which will benefit fish and wildlife resources. PG&E will provide the prescribed instream flow releases specified in Tables 1 and 2 of Attachment 1 or the natural flow, whichever is less, and the Ramping Rates specified in Attachment 2. For those dams that are being decommissioned, PG&E will transfer the associated water diversion rights to CDFG, as more fully described in Section 6.1 E.

At the discretion of the Resource Agencies, the prescribed instream flow releases will be initiated and maintained commencing January 1, 2001, or upon issuance of the Final FERC Order, whichever occurs later. Should any such prescribed instream flow releases not commence on January 1, 2001, the associated foregone power generation payment specified in Section 10.2 shall be reduced in proportion to the time at which power generation is actually foregone.

4.3 Water Acquisition Fund

This component of the proposed Restoration Project is described in Section 9.2 A.

4.4 Adaptive Management Plan

This component of the proposed Restoration Project is described in Section 9.1.

4.5 Adaptive Management Fund

This component of the proposed Restoration Project is described in Section 9.2 B.

5.0 CONTINGENCIES AND LIMITATIONS

This MOU does not commit the Parties to activities beyond the scope of their respective missions, funding and authorities. Except for the federal portion of the Restoration Project funding provided for in Section 10.1, it is recognized that any federal funding needed to carry out any federal agency responsibilities under this MOU shall be subject to the availability of appropriated funds pursuant to the Anti-Deficiency Act (31 U.S.C. Section 1341). A lack of funding to meet the Agencies' respective responsibilities shall not result in the transfer of such responsibilities or funding obligations to PG&E. In recognition that final designs and detailed cost estimates will be further refined through the process described in Section 8.0, the Parties agree that if sufficient funding is not available to accommodate the final estimates, they will jointly pursue additional funding.

5.1 The Agencies recognize that USBR will be the Agency that will receive the federal funding for the construction component of the Restoration Project. Thus, USBR, and not the Resource Agencies, will be responsible for any construction and decommissioning cost overruns, as provided in Section 10.2.

5.2 This MOU is of no force and effect until signed by all Parties. Any work initiated prior to the approval date is done at each Party's own risk.

- 5.3** The Parties understand and agree that the implementation of any and all activities by CDFG, NMFS, USBR, and USFWS, pursuant to this MOU, with the exception of initial consultations and planning activities, are contingent upon compliance with NEPA and CEQA. The Parties anticipate that activities described in this MOU will be identified in any NEPA/CEQA document as an alternative, but also acknowledge that other alternatives will be considered in the NEPA/CEQA process prior to the time that a final decision or an irreversible commitment of resources or funds is made toward any one alternative.
- 5.4** The Parties understand and agree that certain undertakings of PG&E pursuant to this MOU are subject to approval by FERC and CPUC. In the event that the Final FERC Order amending the license for FERC Project No. 1121 and/or any necessary CPUC approval is materially different from the terms and conditions of the license amendment application, then this MOU may be amended as provided in Section 13.0 or terminated as provided in Section 16.0.
- 5.5** The Parties understand and agree that no permanent changes to facilities or operations are required pursuant to this MOU prior to issuance of a Final FERC Order, as defined in Section 2.13 above. The Parties also understand and agree that certain preliminary tasks must be performed to support the proposed license amendment application to FERC prior to the Final FERC Order, in order to assist in accomplishing the Restoration Project. Within sixty (60) days of the effective date of this MOU, PG&E and CDFG will begin consultations and develop a process with the State Water Resources Control Board (SWRCB) with respect to the petition specified in Section 6.1 E. CDFG and PG&E will work diligently with the Resource Agencies and SWRCB to finalize the dedication process after issuance of the Final FERC Order.
- 5.6** Nothing in this MOU, whether or not incorporated into the terms of the license for FERC Project No. 1121, is intended or shall be construed as a precedent or other basis for any argument that the Parties have waived or compromised any rights which may be available under state or federal law. In addition, nothing in this MOU shall establish a precedent regarding hydroelectric jurisdictional issues.

5.7 The Resource Agencies assert that the current and proposed facilities of FERC Project No. 1121, including those outlined in this MOU, are operating, and will continue to operate, in habitat occupied by Sacramento River winter-run chinook salmon, spring-run chinook salmon, Central Valley steelhead and other species listed under the ESA and the California Endangered Species Act. Nothing in this MOU is intended to bind or prejudice the Resource Agencies, or otherwise limit their respective authorities, in the performance of their responsibilities under these Acts and other applicable federal and state laws.

5.8 If there is any dispute regarding provisions of this MOU and the Agreement in Principle included as Attachment 1, the provisions of this MOU shall govern.

6.0 ROLES AND RESPONSIBILITIES

6.1 PG&E

A. As more fully described below, PG&E has agreed to a number of physical and operational changes and additions to FERC Project No. 1121, as well as the assumption of a number of future costs, which cumulatively are estimated to have a value of approximately \$20,550,900 of the Total Project Cost during the term of this MOU. PG&E, however, recognizes that these costs may exceed those estimates and agrees it is responsible for all cost overruns for Restoration Project components which are identified as funded by PG&E in Table 3 of Attachment 1. This amount includes PG&E's participation in a portion of the biological and environmental monitoring more fully described in Section 7.3. PG&E's financial participation in this Restoration Project will consist of: (a) providing 90% of the prescribed instream flow releases listed in Attachment 1 without monetary compensation; (b) assumption of 100% of any increased operation and maintenance costs due to facility and operational changes resulting from the Restoration Project; (c) absorption of the loss of foregone power as a consequence of Ramping Rate requirements described in Attachment 2; and (d) assumption of the cost of screen and ladder repairs and replacements due to normal wear and tear, catastrophic

damage, and any other damage. In the event of exhaustion of the Water Acquisition Fund and Adaptive Management Fund, PG&E acknowledges and agrees that it will pay for authorized modifications to FERC Project No. 1121 facilities or operations which are determined to be necessary under Adaptive Management or pursuant to applicable state or federal law.

- B.** PG&E will pay all of its internal costs associated with the FERC license amendment required to implement the Restoration Project. PG&E will engage in a collaborative license amendment process to develop the license amendment application for submittal to FERC. PG&E will include in its amendment application pertinent environmental compliance documents prepared by USBR as described in Section 6.2. PG&E will also participate in and provide limited internal technical and fishery expertise, at its expense, to assist with the biological and environmental monitoring efforts described in Section 7.3 and will cooperate/work with the Resource Agencies conducting analyses, reviewing results, and identifying potential Adaptive Management actions for the Restoration Project.
- C.** The Parties will work in concert to develop a license amendment application for FERC Project No. 1121. PG&E will file an amendment to its license for FERC Project No. 1121 to implement those actions under FERC's authority, consistent with the pertinent provisions of this MOU, necessary to implement the Restoration Project. Unless otherwise provided in this MOU, PG&E will fund preparation of the license amendment application, including preparation of the application sections which describe the current and proposed facilities and operation, FERC Project No. 1121 economics, and also modify the existing License Exhibit drawings to reflect the proposed changes to FERC Project No. 1121. PG&E will also be responsible for preparing responses to any additional information requests issued by FERC regarding the responsibilities enumerated in this Section.

- D.** PG&E will provide the prescribed instream flow releases and Ramping Rates identified in Attachments 1 and 2, and any agreed-upon future changes to these prescribed instream flow releases or Ramping Rates resulting from the Adaptive Management Plan described in Section 9.1, until the end of the current FERC license and any subsequent annual licenses. The Parties acknowledge that this commitment to provide the prescribed instream flow releases and Ramping Rates is subject to change by FERC in the license amendment process and at the expiration of the current license term in 2026. PG&E and the Resource Agencies (subject to applicable state and federal laws) agree to support the continuation of such prescribed instream flow releases and Ramping Rates, and any agreed upon future changes, in the next relicensing proceeding for FERC Project No. 1121.
- E.** PG&E's water diversion rights associated with all dams to be decommissioned (see Section 4.1) in the Restoration Project Area shall be transferred to CDFG. For example, when the rights for Soap Creek Diversion are transferred, all rights associated with that diversion will be transferred, including but not limited to, PG&E's Bluff Springs rights, which are subject to an agreement regarding senior water rights for Hazen Ditch, (Bluff Springs - Hazen Ditch Water Users Agreement, dated May 31, 1988). PG&E shall execute deeds or other mutually agreed upon documents to transfer these water diversion rights. PG&E will execute and deliver such deeds or other mutually agreed upon documents at the time of PG&E's receipt of those associated portions of the \$2,137,100 specified in Section 10.2. CDFG agrees that the water rights transferred by PG&E to CDFG shall not be used by CDFG or any successor in interest, assignee, or designee to increase prescribed instream flow releases above the amounts specified in Attachment 1, or developed pursuant to the Adaptive Management Plan, nor shall they be used adversely against remaining FERC Project No. 1121 upstream or downstream diversions, until such time as the FERC license is abandoned, whereupon the limitation regarding transferred water rights will no longer apply.

PG&E agrees that its riparian rights associated with lands within the Restoration Project Area shall not be used by PG&E or any successor in interest, assignee, or designee to decrease prescribed instream flow releases below the amounts specified in Attachment 1, or developed pursuant to the Adaptive Management Plan. PG&E agrees that any deed transferring such riparian land or rights shall contain the above restriction in use of the riparian rights.

PG&E and CDFG shall jointly file a petition with the State Water Resources Control Board (SWRCB) pursuant to Water Code Section 1707 to dedicate the water diversion rights associated with all decommissioned dam sites in the Restoration Project Area to instream uses. The Agencies agree to support the petition.

- F.** The prescribed instream flow releases described in Attachment 1 for all those dams remaining in FERC Project No. 1121 will be included in the FERC license amendment application to be filed by PG&E.
- G.** PG&E is responsible for the operation, maintenance, and replacement of all physical modifications to its facilities under this MOU on Battle Creek due to normal wear and tear, catastrophic damage, and any other type of damage, and will ensure that the new fish screen and ladder facilities meet the Fail-Safe criteria. Installation costs of facilities installed under the Adaptive Management Fund protocols are excepted. PG&E's responsibilities under this section begin once the facility start-up and acceptance testing is successfully completed by USBR and PG&E. At that point PG&E shall accept and take over the facilities.
- H.** PG&E is responsible for assisting in design data collection activities for all facilities, as determined under the cooperative design processes established through the Project Management Team and Technical Team, as described in Section 8.2.

- I.** PG&E, as a member of the Project Management Team established under Section 8.2, is jointly responsible along with the other Parties for review of and concurrence in all designs, engineering, specifications, facility modifications, decommissioning procedures, facility removal, and other activities associated with planning, permitting, and construction. PG&E will have lead responsibility for real estate requirements and transactions, including access authorization for Agency personnel to accomplish their responsibilities under this MOU. Real estate actions will be subject to review and carried out in a cooperative process through the Project Management Team and Technical Team as established in Section 8.2. PG&E shall also be responsible along with the other Parties for the development, review, and concurrence of site restoration plans and designs subject to any requirements established through the permitting process. While USBR will be responsible for obtaining permits as described in Section 6.2, such permitting actions will be done in full cooperation with the Parties to ensure input from PG&E related to the content and conditions established in the permitting process. The technical efforts associated with the activities described in this paragraph will be performed on a reimbursable basis from federal funding provided through USBR as described in Section 10.2.
- J.** While USBR retains lead responsibility for all design, procurement, and construction associated with the Restoration Project, situations may arise in which it would be safer and more efficient for PG&E construction crews to perform the construction or removal of some facilities. PG&E may perform construction work associated with the Restoration Project as coordinated through the framework of the Project Management Team as described in Section 8.2. Such cooperative decisions related to construction responsibilities will be completed by the end of the conceptual design phase. Such construction work will be performed on a reimbursable basis from federal funding provided through USBR as described in Section 10.2.

- K.** Contracts will be awarded in accordance with applicable state and federal laws. For contracts awarded by USBR, USBR will confer with PG&E regarding the selection of contractors or other entities for any portion of the work to be performed as part of the Restoration Project. For any contract awarded by USBR that is not a conventional sealed bid, a representative from PG&E will be a member of the team reviewing and recommending the award of these contracts to the USBR Contracting Officer. The final decision on contract award will be made by USBR's Contracting Officer. If USBR decides that it does not intend to follow PG&E recommendations regarding contractor selection, USBR will provide a written statement to PG&E explaining why USBR chose not to follow the PG&E recommendations.
- L.** PG&E may elect to conduct its own inspection of construction work performed by others as part of the Restoration Project. Any findings or deficiencies identified by PG&E will be immediately reported to the USBR Construction Engineer. USBR will review and respond to PG&E on any findings of deficiencies including how they will be addressed. Any disagreements will be subject to a dispute resolution process developed by USBR and PG&E. Such inspection services will be performed on a reimbursable basis from federal funding provided through USBR as described in Section 10.2.
- M.** PG&E shall be responsible for all monitoring required by FERC through the FERC license amendment for FERC Project No. 1121. PG&E will also participate in and provide limited internal technical and fishery expertise, at its expense, to assist with the biological and environmental monitoring efforts described in Section 7.3, which are the responsibility of the Resource Agencies. PG&E shall be responsible for all of the facility monitoring more particularly described in Section 7.2.
- N.** PG&E shall assume the role of applicant for hydropower project operation compliance with Section 404 of the Clean Water Act, certification under Section 401 of the Clean Water Act, and other applicable state and federal laws.

- O.** To the extent permissible under the provisions of its existing easements with private property owners, PG&E will provide access to Agency representatives engaged in the performance of their respective responsibilities under this Restoration Project. Protocols for Agency exercise of this access permission will be developed and will address: (1) property owner concerns; (2) PG&E notification; (3) liability issues and any other pertinent matters associated with the specific locations; and (4) property owner notification.

6.2 USBR

- A.** USBR, along with the Resource Agencies, has applied to CALFED for public funding for the Restoration Project and will continue to support that application, consistent with the terms of this MOU.
- B.** USBR shall assume the role of lead agency for purposes of regulatory compliance for construction activities associated with the Restoration Project, including the National Environmental Policy Act (42 U.S.C. 4321 et seq. (NEPA)), Section 106 of the National Historic Preservation Act, and the Fish and Wildlife Coordination Act (16 U.S.C. 661-666(c)). USBR shall also act as the federal action agency under Section 7 of the ESA for the construction aspects of the Restoration Project in a joint consultation with FERC acting as lead agency for operation of FERC Project No. 1121. In addition, USBR shall assume the role of applicant for purposes of construction compliance of the Restoration Project with Section 404 of the Clean Water Act, certification under Section 401 of the Clean Water Act and other applicable regulatory permitting required by state and federal laws.
- C.** USBR shall assume the role of lead agency, and in consultation with PG&E, arrange for all final engineering design documents and specifications, construction, start-up and acceptance testing, and implementation of mitigation and monitoring for the construction activities associated with the Restoration Project, as defined in Section 4.1. USBR shall be responsible for the production of the required environmental documents and the

detailed decommissioning plan, with all the supporting engineering, biological, and other technical studies, and preparation of the design drawings needed for the license amendment. Funding for responses to any subsequent additional information requests issued by FERC regarding the responsibilities enumerated in this Section will be borne by USBR.

- D.** USBR will participate in the construction monitoring for the Restoration Project as described in Section 7.1.

6.3 NMFS

- A.** The Parties acknowledge and agree that NMFS has made no determination, and is giving the Parties no assurances, regarding compliance of the Restoration Project or PG&E's operation of its FERC Project No. 1121 with the ESA.
- B.** NMFS agrees to do the following, to the extent NMFS determines that these provisions are consistent with the biological opinion rendered for the proposed Restoration Project and its responsibilities under the ESA to conserve threatened and endangered species and their habitats:
 - 1.** Support a petition to the SWRCB for the instream dedication of that amount of water diversion rights transferred by PG&E to CDFG as more fully described in Section 6.1 E;
 - 2.** Support the amendment of the license of FERC Project No. 1121, described in Section 6.1 C, that incorporates the facility modifications described in Section 4.1, the prescribed instream flow increases described in Tables 1 and 2 of Attachment 1, the Ramping Rates described in Attachment 2, and further support the position that FERC focus the license amendment on the fishery restoration actions described in this MOU in order to facilitate the process for a FERC decision allowing the Restoration Project to go forward in a timely manner; and

- 3.** In the next relicensing proceeding for FERC Project No. 1121, support the continuation of the prescribed instream flow releases described in Attachment 1 and Ramping Rates described in Attachment 2, and any changes to those prescribed instream flow releases or Ramping Rates resulting from Adaptive Management, subject to applicable law.
- C.** Regarding the biological and environmental monitoring described in Section 7.3, NMFS agrees to support incorporating Battle Creek monitoring needs into appropriate CVPIA, CALFED, and other monitoring programs.
- D.** As approving and implementing various activities described in the MOU will result in a major federal construction activity affecting listed salmonids under NMFS' jurisdiction, NMFS will conduct the requisite Section 7 consultation for species under its authority. The above measures will require FERC to exercise its federal discretionary authority in approving an amendment of the license for FERC Project No. 1121 prior to implementation. This action, as well as FERC's continuing oversight over FERC Project No. 1121 operations, constitutes a Federal Action for the purposes of Section 7 of the ESA. Therefore, FERC will be designated Lead Federal Agency. The referenced Section 7 consultation will also encompass various planning and construction-related activities to be undertaken by USBR and therefore, will be conducted jointly with FERC and USBR. NMFS will consult with FERC and USBR under Section 7 of the ESA to ensure the proposed changes to the facilities and operation of FERC Project No. 1121 comply with the ESA.

6.4 USFWS

- A.** The Parties acknowledge and agree that USFWS has made no determination, and is giving the Parties no assurances, regarding compliance of the Restoration Project or PG&E's operation of its FERC Project No. 1121 with the ESA.

- B.** USFWS agrees to do the following:
- 1.** Support a petition to the SWRCB for the instream dedication of that amount of water diversion rights transferred by PG&E to CDFG as more fully described in Section 6.1 E;
 - 2.** Support the amendment of the license of FERC Project No. 1121, described in Section 6.1 C, that incorporates the facility modifications described in Section 4.1, the prescribed instream flow releases described in Tables 1 and 2 of Attachment 1, the Ramping Rates described in Attachment 2, and further support the position that FERC focus the license amendment on the fishery restoration actions described in this MOU in order to facilitate the process for a FERC decision allowing the Restoration Project to go forward in a timely manner; and
 - 3.** In the next relicensing proceeding for FERC Project No. 1121, support the continuation of the prescribed instream flow releases described in Attachment 1 and Ramping Rates described in Attachment 2, and any changes to those prescribed instream flow releases or Ramping Rates resulting from Adaptive Management, subject to applicable law.
- C.** Regarding the biological and environmental monitoring described in Section 7.3, USFWS agrees to support incorporating Battle Creek monitoring needs into appropriate CVPIA, CALFED, and other monitoring programs.
- D.** As approving and implementing various activities described in the MOU will result in a major federal construction activity that may affect species under USFWS jurisdiction, USFWS will conduct the requisite Section 7 consultation for species under its authority. The above measures will require FERC to exercise its federal discretionary authority in approving an amendment of the license for FERC Project No. 1121 prior to implementation. This action,

as well as FERC's continuing oversight over FERC Project No. 1121 operations, constitutes a Federal Action for the purposes of Section 7 of the ESA. Therefore, FERC will be designated Lead Federal Agency. The referenced Section 7 consultation will also encompass various planning and construction related activities to be undertaken by USBR and therefore, will be conducted jointly with FERC and USBR. USFWS will consult with FERC and USBR under Section 7 of the ESA to ensure the proposed changes to the facilities and operation of FERC Project No. 1121 comply with the ESA.

6.5 CDFG

- A.** The Parties acknowledge and agree that CDFG has made no determination, and is giving the Parties no assurances, regarding compliance of the Restoration Project or PG&E's operation of its FERC Project No. 1121 with applicable state law.
- B.** The Parties acknowledge and agree that CDFG is not responsible for funding any component of the Restoration Project, including any cost overruns.
- C.** CDFG agrees to do the following:
 - 1.** CDFG and PG&E shall jointly file a petition with the State Water Resources Control Board (SWRCB) pursuant to Water Code Section 1707 to dedicate the water diversion rights associated with the decommissioned dam sites in the Restoration Project Area to instream uses;
 - 2.** Support the amendment of the license of FERC Project No. 1121, described in Section 6.1 C, that incorporates the facility modifications described in Section 4.1, the prescribed instream flow releases described in Tables 1 and 2 of Attachment 1, the Ramping Rates described in Attachment 2, and further support the position that FERC focus the license amendment on the fishery restoration actions described in this MOU in order to facilitate the

process for a FERC decision allowing the Restoration Project to go forward in a timely manner; and

3. In the next relicensing proceeding for FERC Project No. 1121, support the continuation of the prescribed instream flow releases described in Attachment 1 and Ramping Rates described in Attachment 2, and any changes to those prescribed instream flow releases or Ramping Rates resulting from Adaptive Management, subject to applicable law.
- D. Regarding the biological and environmental monitoring described in Section 7.3, CDFG agrees to support incorporating Battle Creek monitoring needs into appropriate CVPIA, CALFED, and other monitoring programs.

7.0 MONITORING AND REPORTING

7.1 Construction Monitoring, Start-up, and Acceptance Testing

- A. USBR agrees to perform all construction monitoring and reporting required as part of construction of the Restoration Project as described in Sections 6.2 and 8.4. Funding for the construction monitoring will be derived only from the federal funding as identified in Section 10.2, and USBR does not agree to spend any additional, federal money to perform such construction monitoring. Construction monitoring includes those parameters required by the permits developed pursuant to the Clean Water Act, and mitigation actions adopted pursuant to CEQA, NEPA, ESA, and related FERC requirements.
- B. USBR agrees to perform all start-up and acceptance testing, and prepare the necessary documents and reports, up to and until PG&E and USBR jointly determine that the constructed facilities' operation meets the design criteria. Completion inspections for each construction contract will be performed by both USBR and PG&E and certifications of approval will be issued jointly by USBR and PG&E. If construction of a particular Restoration

Project feature does not meet with the satisfaction of either party, a checklist of needed work prior to the certification of completion will be prepared and agreed to by both parties. Upon mutual agreement of the parties, a completed portion of the construction contract or a Restoration Project feature may be turned over to PG&E for operation and maintenance.

Start-up and acceptance testing for both screens and ladders will include, but is not limited to, measurements of velocity and flow collected from each component of the structure at several stage heights to evaluate actual hydraulic performance and reliability over the full range of operating conditions as compared to the design specifications.

7.2 Facility Monitoring

PG&E, in consultation with the Agencies, shall prepare a detailed facility monitoring plan to be submitted to FERC as part of the license amendment application. PG&E shall perform and assume the costs for the following facility monitoring:

- A.** At the various outlet and spillway works for North Battle Creek Feeder, Eagle Canyon, Inskip, and Asbury Pump (Baldwin Creek) Diversion Dams, operate properly calibrated remote sensing devices that continuously measure and record total flow and the fluctuation of stage immediately below each dam during all operations for the purpose of verification of FERC license compliance. All flow and stage recording methodologies shall be approved by FERC;

- B.** At the fish ladders at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams, operate properly calibrated remote sensing devices that continuously monitor water surface elevations at the top and bottom of the ladder to identify debris problems. In addition, continuously operate a calibrated automated fish counter or an underwater video camera to document fish movement through the ladder during the initial three-year period of operation, or as otherwise agreed upon by the Parties; and

- C. At the fish screens at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams, operate properly calibrated remote sensing devices that continuously monitor water surface elevation differences on the inlet and outlet side of screens to identify plugging.

7.3 Biological and Environmental Monitoring

The biological and environmental monitoring described below will address the overall status of anadromous fish populations and related ecosystem health in the Battle Creek watershed which includes the Restoration Project Area. The Parties understand and agree that biological and environmental monitoring in the watershed and Restoration Project Area will be performed by USFWS and/or CDFG, or their designated representatives, using available funding from Central Valley fishery restoration funding sources, including but not limited to, the \$1,000,000 federal funding allocation for the Restoration Project described in Section 10.2; and CALFED's Comprehensive Monitoring Assessment Research Program; and CVPIA's CAMP. The Parties understand and agree that if sufficient funding is not available through the above sources they will jointly pursue other appropriate funding sources.

The Parties will jointly prepare the Agencies' detailed biological and environmental monitoring component of the Adaptive Management Plan described in Section 9.1 A 2 (b). The biological and environmental monitoring will include, but is not limited to:

- A. Estimates of the number and species of upstream migrant salmonids entering upper Battle Creek via the fish ladder at Coleman National Fish Hatchery Barrier Weir, using underwater video or automated fish counters and intermittent use of a fish trapping facility to sample individual fish for species/run identification;
- B. Estimates of the relative abundance and distribution and immigration timing of adults in the Battle Creek watershed, using the most efficient and safe method for the particular stream reach, including underwater observation, carcass, redd and/or aerial

surveys;

- C. Estimates of the relative abundance, distribution, and out-migration timing of juveniles, using downstream migrant trap installations in the Battle Creek watershed;
- D. Characterization of the temperature regime in the Battle Creek watershed by continuously measuring and recording water temperatures and meteorological conditions during the appropriate periods; and
- E. Examination of fish passage conditions at natural obstacles that change in the stream canyon areas over time, such as clusters of debris and boulders, by observing these areas during other fish survey activities and more detailed analysis at sites that undergo major reconfiguration.

The biological and environmental monitoring described above is beyond the scope of PG&E's facility monitoring described in Section 7.2.

7.4 Other Monitoring

The Parties agree that any monitoring of Restoration Project actions, other than the monitoring described in Sections 7.1 and 7.3 which may be required pursuant to the license for FERC Project No. 1121 will be done by PG&E at its sole cost.

7.5 Reporting and Notice Requirements

PG&E will make available all facility monitoring reports to the Resources Agencies and CALFED upon specific request. The fish use records at the fish ladders shall be made available on a monthly basis to the Resource Agencies during the initial three-year period of operation, or as otherwise agreed upon by the Parties. Upon discovery of any occurrence of operation of a screen, ladder, or water release mechanism outside of the requisite specifications, notification will be made by PG&E to NMFS and CDFG as soon as possible, but no later than the next day of operation. The notification shall include a description of the deviation, any necessary

corrective measures taken or proposed, and an implementation schedule if the situation has not been corrected.

All biological and environmental monitoring results and analyses described in Section 7.3 will be presented by the Resource Agency performing the monitoring in annual reports to the Parties and FERC and will be made available to CALFED and other interested persons upon request.

8.0 PLANNING, PERMITTING, AND CONSTRUCTION ACTIVITIES

8.1 Schedule

The Parties agree to use their best efforts to implement the Restoration Project according to the schedule in Attachment 3. The Parties shall use their best efforts to complete the planning and construction activities on the South Fork on a priority basis, related to biological criteria.

8.2 Organizational Structure and Responsibilities

Planning, permitting and construction of the Restoration Project will be implemented through a cooperative effort of the Project Management Team (PMT), Project Manager, and Technical Team (TT).

A. Project Management Team

The PMT is a management level group that will make all final decisions regarding planning, permitting, and construction activities of the Restoration Project through the Consensus process. Members of the PMT include representative(s) from each of the Parties, California Department of Water Resources (DWR) and SWRCB. For purposes of determining Consensus, each of Parties to this MOU as well as DWR and SWRCB will be afforded one vote. If Consensus is not achieved, disputes will be resolved through the dispute resolution process described in Section 14.0. The PMT shall address, but shall not be limited to, issues related to the planning, permitting, and construction of the Restoration Project, including issues related to: policy; design; plans and

specifications; scheduling; real property and relocation requirements; real property acquisition; contract awards and modifications; contract costs; cost projections; final inspection of the entire Restoration Project or functional portions of the Restoration Project; preparation of the proposed operation, maintenance, repair, replacement, and rehabilitation manual; anticipated requirements and needed capabilities for performance of operation, maintenance, repair, replacement, and rehabilitation of the Restoration Project; and any other related matters. The PMT shall direct and manage the TT and resolve any disputes that have been elevated to the PMT by the TT. In addition, the PMT may make recommendations to the TT through the Project Manager that it deems warranted on matters that the PMT generally oversees, including suggestions to avoid potential sources of dispute.

Funding for the administrative, clerical, and support facilities for the PMT will be provided by federal funding described in Section 10.2. The Chair of the PMT will be a USBR representative.

B. Project Manager

The Project Manager is an employee of USBR and will be responsible for coordinating the implementation of activities among the Parties, with other appropriate interested persons, and with all state and federal agencies with jurisdiction over some aspect of the Restoration Project. The Project Manager is a member of the PMT and, after the effective date of this MOU, will meet at appropriate frequency with the TT to assess Restoration Project status and to facilitate coordination.

C. Technical Team

The TT is a cooperative group established to address technical issues arising as a result of implementing the Restoration Project. The TT will be responsible for the necessary day-to-day actions required to implement the planning, design, and construction decisions of the PMT. Members of the TT include representative(s) from each of the Parties, DWR and the SWRCB

with appropriate training and experience to effectively address the technical aspects of implementing the Restoration Project. Disciplines within the responsibility of the TT include, but are not limited to, environmental compliance, construction monitoring, planning activities, engineering and design, permitting, real estate actions, public involvement, and construction. All unresolved technical issues will be referred to Project Manager for resolution or elevation to the PMT.

Funding for the administrative, clerical, and support facilities for the TT will be provided by federal funding described in Section 10.2. The Chair of the TT will be the Project Manager.

8.3 Planning Activities

Planning includes all activities associated with NEPA/CEQA compliance, permitting actions, design data collection, conceptual designs, final designs, specification preparation, real estate acquisition, public involvement, quality control, and procurement processes leading to construction.

8.4 Construction Activities

A. Construction implementation will be carried out by USBR unless otherwise determined cooperatively between USBR and PG&E. The following schedules will be submitted by the responsible construction agency to the Parties upon request:

- 1.** A master work schedule showing the construction work to be performed or caused to be performed by USBR under this MOU, including total estimated costs for work accomplishments each Fiscal Year (October 1 to September 30);
- 2.** A detailed schedule for the initial construction quarter consistent with the master work schedule specifying the work to be performed during the construction quarter, including the amount of funds required during that quarter

for the work scheduled and including sums expended for the preparation of designs and specifications, engineer's estimates, other pre-construction activities required to initiate construction and construction activities; and

3. Subsequent detailed quarterly work schedules consistent with the master work schedule specifying the work proposed to be performed or initiated during each quarter of the construction period other than the initial quarter, including the amount of funds required during each quarter.
- B.** The party responsible for construction at a particular site, whether it be USBR or PG&E, will provide each other written progress reports on a weekly basis or such other time period as mutually agreed to by the PMT. Construction activities undertaken by a party pursuant to this MOU shall be open and subject to inspection by the other party or their representative at all times during the progress thereof and upon completion. Should either party determine that any such construction work is not being performed, or has not been completed, in accordance with applicable schedules, plans, designs and specifications, or any other requirement of this MOU, then that party shall give written notice thereof to the other party within 30 days after inspection. This notice shall specify the corrective actions which must be taken and the schedule for their completion. USBR and PG&E agree to provide each other with copies of claims, change orders, and correspondence involving major cost or design changes between themselves and third party contractors performing any of the construction or decommissioning activities.
- C.** USBR and PG&E also agree to provide each other with a summary of costs incurred in the performance of this MOU on a quarterly basis. At the conclusion of construction of the improvements, USBR and PG&E shall furnish each other with an accounting of the final costs of their respective contributions to the completed improvements.

- D. All work shall be performed in accordance with USBR Safety and Health Standards, any applicable PG&E standards, and OSHA and Cal-OSHA regulations. In the event of any conflicts, the most stringent requirements shall apply.

8.5 Public Participation

All PMT and TT meetings will be open to any interested persons. Additional opportunities for public participation will be afforded in the NEPA/CEQA and FERC license amendment processes.

9.0 ADAPTIVE MANAGEMENT

The Parties agree that Adaptive Management is an integral component of the Restoration Project. Adaptive Management is a process that: (1) uses monitoring and research to identify and define problems; (2) examines various alternative strategies and actions for meeting measurable biological goals and objectives; and (3) if necessary, makes timely adjustments to strategies and actions based upon best scientific and commercial information available.

The primary reason for using an Adaptive Management process is to allow for changes in the restoration strategies or actions that may be necessary to achieve the long-term goals and/or biological objectives of the Restoration Project and to ensure the likelihood of the survival and recovery of naturally-spawning chinook salmon and steelhead. Using Adaptive Management, restoration activities conducted under the Restoration Project will be monitored and analyzed to determine if they are producing the desired results (i.e., properly functioning habitats).

As implementation of the Restoration Project proceeds, results will be monitored and assessed. If the anticipated goals and objectives are not being achieved, then adjustments in the restoration strategy or actions will be considered through the Adaptive Management Plan, which will be developed consistent with the relevant CALFED guidelines. The Water Acquisition Fund and Adaptive Management Fund are elements of Adaptive Management which will provide funding for potential changes to Restoration Project actions that result from application of the Adaptive Management Plan (AMP).

9.1 Adaptive Management Plan

The AMP will be submitted by PG&E to FERC at the time that PG&E files its license amendment application pursuant to this MOU. The Parties acknowledge that implementation of the AMP could later involve proposals for changes in operations, project facilities, and possible decommissioning of some additional FERC Project No. 1121 facilities to improve biological effectiveness and habitat values for chinook salmon or steelhead.

Subject to Section 6.1 D, the Parties agree that for the term of the existing FERC license, and any subsequent annual licenses, the instream flows developed by the AMP will not be lower than the prescribed instream flow releases specified in Attachment 1, unless agreed to by the Resource Agencies, and submitted to FERC for approval. The Parties acknowledge that the Resource Agencies cannot waive their responsibilities under federal and state law, and specifically reserve their jurisdiction under the ESA and other federal and state laws.

If prescribed instream flow releases are reduced below those specified in Attachment 1, and later determined to be insufficient, any later increase of prescribed instream flow releases up to the amounts described in Attachment 1 shall not be compensated by funds provided in Sections 9.2 A and 9.2 B. However, any increase of prescribed instream flow releases above those set forth in Attachment 1 shall be compensated through the AMP.

In order to ensure timely implementation of Adaptive Management measures, the AMP will identify the range of possible Restoration Project adjustments that may be implemented due to new information, risk, uncertainty, or opportunity. The intent of this provision is to enable FERC to approve the range of future adjustments that may be undertaken pursuant to this license amendment.

A. AMP Development

The AMP will include: a statement of the Restoration Project goals and objectives; a monitoring component; protocols for

assessing information and formulation of recommended changes; general procedures for prioritizing expenditures from the Adaptive Management Fund (see Section 9.2 B) and Water Acquisition Fund (see Section 9.2 A); procedures for modifying management approaches using best scientific and commercial information available; public participation; and an outline of the agreed-upon scope of adjustments to the Restoration Project. The AMP will be developed by the Resource Agencies and PG&E through the Consensus process prior to filing the license amendment application with FERC. The AMP will include milestones, timelines, and trigger points for consideration of changes.

The term of the AMP will coincide with the duration of this MOU and will include milestones that are reviewed at scheduled intervals.

1. Participants

The AMP will be developed through the Consensus process by the Resource Agencies and PG&E. Interested persons may attend any meeting, contribute to discussions, and provide suggestions regarding development of the AMP. Specific notice, in addition to any general notice, of any such meetings will be sent to: (1) the Battle Creek Watershed Conservancy; (2) CALFED; and (3) any person requesting such notification.

2. Elements

(a) Goals and Objectives

Biological goals are the broad guiding principles for the AMP and are the rationale behind the minimization and mitigation strategies and/or actions. Specific biological objectives are the measurable targets for achieving the biological goals. The goal of the AMP is to implement specific actions to protect, restore, enhance, and

monitor salmonid habitat at FERC Project No. 1121 to guard against false attraction of adult migrants and ensure that chinook salmon and steelhead are able to fully access and utilize available habitat in a manner that benefits all life stages and thereby maximizes natural production, fully utilizing ecosystem carrying capacity.

The provisions of the AMP will include measurable biological objectives. Those biological goals and objectives must be based on the best scientific and commercial data available and reflect the realistic potential of the Restoration Project to restore anadromous fish in Battle Creek. The biological goals and objectives of the AMP will integrate habitat and multispecies-specific needs.

(b) Monitoring

The monitoring component of the AMP will be designed to ensure proper data collection and analysis in order to guide appropriate adjustments to the Restoration Project. The monitoring component also will provide the information necessary to assess compliance, achievement of Restoration Project results, and verification of progress toward the established biological goals and objectives. Specific reporting requirements will be an integral part of the monitoring component to assure appropriate dissemination of data collected. The frequency, organization, and content of reports that differ from Section 7.5 will be determined through Consensus in the development of the AMP.

The monitoring component will be flexible to allow modification, as necessary, based on the need for additional information or to assess unanticipated outcomes. The monitored parameters will reflect

the biological objective's measurable units (e.g., if the biological objective is stated in terms number of chinook salmon, the monitoring component should describe the procedures for measuring the estimated number of chinook salmon). The monitoring component will be based on the best scientific and commercial information available and use established surveying methods and techniques, and other protocols. The monitoring component will also clearly designate responsibility for the various aspects of monitoring based on the provisions of Sections 7.2 and 7.3, and will identify the measures the Resource Agencies and PG&E will take to ensure adequate funding for their respective future monitoring responsibilities.

(c) Assessment

The information obtained through monitoring will be analyzed and evaluated according to protocols identified in Section 9.1 B to assess the results of restoration actions relative to established goals and objectives. Information acquired will be used to determine the need for adjusting goals, altering the monitoring program to obtain additional data, or developing recommended modifications to restoration actions already in place. For instance, the Ramping Rates and threshold flow levels will be monitored to ascertain their effectiveness to avoid stranding and/or isolating anadromous fish. If the monitoring results indicate adjustment to the Ramping Rates or threshold flow values are warranted, then recommendations will be formulated and submitted to the Adaptive Management Policy Team for consideration.

B. Implementation

Adaptive Management is an integral part of the post-construction implementation of the Restoration Project. The basic organizational structure of the Adaptive Management effort will consist of an Adaptive Management Policy Team (AMPT), and Adaptive Management Technical Team (AMTT).

1. Adaptive Management Policy Team

The AMPT is a management level cooperative group that will make all final decisions regarding the implementation of the Adaptive Management component of the Restoration Project. The AMPT will have a representative from each of the Resource Agencies and PG&E. The members of the AMPT will be familiar with Adaptive Management methodologies adopted by CALFED. Interested persons may attend any AMPT meeting and contribute to discussions. Specific notice, in addition to any general notice, of any such meetings will be sent to: (1) the Battle Creek Watershed Conservancy; (2) CALFED; and (3) any person requesting such notification.

The AMPT shall provide policy direction and resolve any disputes forwarded by the AMTT by Consensus. In the event that the AMPT is unable to reach Consensus within thirty (30) days, dispute resolution procedures, described in Section 14.0, shall be followed.

The Chair of the AMPT will rotate regularly as agreed upon by the AMPT.

2. Adaptive Management Technical Team

The members of the AMTT will include a representative from each of the Resource Agencies and PG&E with appropriate training and experience to effectively address the technical aspects of implementing the AMP. Interested

persons may attend any AMTT meeting and contribute to discussions. Specific notice, in addition to any general notice, of AMTT meetings will be sent to: (1) the Battle Creek Watershed Conservancy and (2) any interested person requesting such notification.

The AMTT will develop the AMP for approval by the AMPT and implement the Adaptive Management component of the Restoration Project upon approval by FERC. The Chair of the AMTT will rotate regularly as agreed upon by the AMTT.

9.2 Adaptive Management Implementation Means

A. Water Acquisition Fund (WAF)

1. Purpose of WAF

An important component of the Restoration Project will be a WAF. The purpose of the WAF is to establish a ready source of money which may be needed for future purchases of additional instream flow releases in Battle Creek which may be recommended under the AMP during the ten (10) year period following the initiation of prescribed instream flow releases listed in Attachment 1. The WAF shall be used solely for purposes of purchasing additional environmentally-beneficial instream flow releases pursuant to the protocols developed by the Resource Agencies and PG&E. The Parties acknowledge that if additional instream flow releases are determined by the Resource Agencies to be required pursuant to the protocols described in Section 9.2 A 3, the ESA, or other applicable law, and (1) the ten (10) year period described above has elapsed and/or (2) there are not sufficient funds in the WAF or the Adaptive Management Fund to pay for such additional instream flow releases, then PG&E shall be responsible for the cost of such instream flow releases.

2. Independent WAF Account

The WAF account will be funded with federal funds described in Section 10.2 and administered by the Resource Agencies following consultation with appropriate interested parties. USBR shall commit \$3,000,000 of such funds to an account or subaccount for the WAF within four months of CALFED approval of federal funds described in Section 10.2. Account disbursement instructions will be developed jointly by the Agencies and PG&E. USFWS shall request disbursements from the WAF in writing, based on the account disbursement instructions.

3. WAF Administrative Protocols

Protocols will be developed by the AMTT to identify environmentally beneficial flow changes for anadromous fish under the AMP to be funded from the WAF.

If Consensus regarding flow changes is not achieved by the AMTT or AMPT, PG&E and the Resource Agencies (collectively), each will choose a person, and together those two persons will choose a single third party who will act as mediator. Each Party shall make its choice within fourteen (14) days from the date of any determination that Consensus has not been achieved, and the third party mediator shall be chosen by those parties no later than forty-five (45) days from such date of determination that Consensus has not been achieved. These times may be extended by mutual agreement of the Resources Agencies and PG&E. If Consensus through mediation is still not achieved, the Resource Agencies and PG&E reserve their right to petition FERC to resolve the subject action. Resource Agencies and PG&E will be responsible for assuming their respective costs for any FERC process.

However, in the interim, instream flow releases determined to be necessary by the Resource Agencies through the

aforementioned protocols will be provided by PG&E until there is either Consensus or FERC approval of the additional instream flow releases. WAF moneys shall be used to implement consensually agreed to or FERC approved actions, and interim actions which have been taken pending FERC action.

4. Payment of WAF Moneys

During the ten-year effective period of the WAF, payment to PG&E for consensually agreed to or FERC approved increased flow releases, and interim instream flow releases which have been taken pending FERC action, will be made in arrears annually. After January 1 following the expiration of the WAF, all uncommitted funds will revert to CALFED, or as otherwise provided by law. During the last year of the WAF, and to the extent that adequate moneys remain in the WAF, funds for agreed to prescribed instream flow releases which will be delivered after expiration of the WAF will be paid to PG&E in one lump-sum based on the net present value of foregone energy for the period inclusive of the realized increased prescribed instream flow releases and expiration date of the current FERC license.

The method of valuation of any additional environmentally beneficial prescribed instream flow releases for the purpose of compensation from the WAF shall be similar to that used for estimating the net present value of foregone power in Attachment 1. The annual in arrears payments described above will be calculated by computing the additional energy foregone on a daily basis over the prior year due to increased prescribed instream flow releases multiplied by the weighted daily energy price published by the California Power Exchange. The lump-sum payment described above will be determined based on the average annual additional foregone energy associated with increased prescribed instream flow releases for a typical water year (e.g. water year 1989). The net present value payment will be based

on the appropriate power values, escalation factor, and discount rate.

B. Adaptive Management Fund (AMF)

1. Purpose of AMF

Another component of the Restoration Project will be an Adaptive Management Fund (AMF) to implement actions developed under the AMP. The Parties agree that the purpose of the AMF is to provide a readily available source of money to be used for possible future changes in the Restoration Project. The AMF shall be used only for Restoration Project purposes directly associated with FERC Project No. 1121 including compensation for prescribed instream flow release increases after the exhaustion or termination of the WAF. The AMF shall be administered pursuant to the AMF protocols. The AMF shall be used to fund unforeseen changes, including changes in the design of the fish screen and/or ladders built as a part of the Restoration Project to improve biological effectiveness and which meet NMFS' adopted criteria. The AMF shall not be used to fund monitoring or construction cost overruns.

2. Independent AMF Account

The AMF, in the amount of \$3,000,000, will be made available to PG&E and the Resource Agencies by a third party donor(s), to fund those actions developed pursuant to the AMP. The third party donor(s) shall deposit the \$3,000,000 in an interest-bearing account pursuant to a separate agreement to be developed jointly by the Resource Agencies, PG&E, and a third party donor(s) after execution of this MOU. This interest-bearing account shall be established no later than six (6) months after execution of this MOU unless otherwise agreed to by the Parties. Account disbursement instructions will be developed

jointly by the Resource Agencies, the third party donor(s) and PG&E.

The Parties agree that: (1) interest on the moneys in the AMF will accrue to the account at a rate to be determined in the agreement and shall be applied to changes in the Restoration Project adopted pursuant to the Adaptive Management protocols; and (2) all uncommitted funds in the AMF will revert to the third party donor(s) or its designee at the end of the current term of the license for FERC Project No. 1121. USFWS shall request disbursements from the AMF in writing, based on the protocols identified below.

3. AMF Administrative Protocols

Protocols will be developed by the AMTT to designate environmentally beneficial Adaptive Management actions to be funded from the AMF pursuant to the AMP.

For funding prescribed instream flow increases, the protocols will be the same as for the WAF described in Section 9.2 A 3. For funding facility modifications, the protocols will be the same as that described in Section 9.2 A 3, with two exceptions: (1) no interim action will be implemented prior to any required FERC approval of a license amendment or other necessary action by FERC; and (2) for all actions resolved by FERC, in which PG&E is in the minority opinion (opposing a proposed action expenditure), the AMF will contribute sixty percent (60%) of any resulting facility modification cost; in the case of PG&E being in the majority opinion (in support of a proposed action expenditure), the AMF will contribute one hundred percent (100%) of any resulting facility modification cost.

10.0 FUNDING

10.1 The total cost of the Restoration Project is currently estimated to be \$50,709,000. USBR has applied to CALFED for the allocation of federal funding in the amount of \$27,158,100. To date, CALFED has tentatively agreed to fund the Restoration Project in that amount, pending execution of this MOU. The balance of \$23,550,900 will include PG&E commitments estimated to be \$20,550,900 and a third party donor(s) contribution of \$3,000,000.

Federal	\$27,158,100
PG&E	\$20,550,900
Third Party Donor(s)	<u>\$3,000,000</u>
	\$50,709,000

10.2 Federal Cost Sharing

The federal portion of the Restoration Project funding will be derived from appropriations authorized under the California Bay-Delta Environmental Enhancement Act (P.L. 104-333). The federal funding is appropriated as “no-year” funds that can be carried forward from one federal fiscal year to the next until it is expended. From the appropriated amount, the Department of the Interior, through USBR, will authorize disbursements for full financing of the federal portion of the Restoration Project as approved in the CALFED process.

Subject to the provisions of Section 5.0, federal cost sharing includes: (1) funding for the construction of all fish screens and fish ladders described in Section 4.1; (2) payment for the construction of connectors and bypasses at South and Inskip Powerhouses; (3) payment for decommissioning studies for Wildcat, Coleman, Soap Creek, Lower Ripley Creek and South Diversion Dams, and Eagle Canyon spring collection facilities as identified in Table 1 of Attachment 1; (4) payment of all costs associated with decommissioning Wildcat, Coleman, Soap Creek, Lower Ripley Creek, and South Diversion Dams, and Eagle Canyon spring collection facilities as identified in Table 1 of Attachment 1, and affected related water conveyance facilities; (5) start-up and acceptance testing of new facilities prior to transfer of operation and

maintenance responsibilities to PG&E; (6) any construction and decommissioning cost overruns; (7) any environmental permitting and documentation necessary for the Restoration Project, including any additional decommissioning studies that might be required by FERC; (8) \$1,000,000 toward payment for the biological and environmental monitoring described in Section 7.3, except that PG&E will participate in such monitoring by contributing limited internal technical and fishery expertise; (9) all required new or modified monitoring and record keeping equipment and facilities and stream gauging facilities needed to demonstrate compliance of the Restoration Project with FERC license conditions or needed for Adaptive Management purposes; (10) assistance in developing the AMP more particularly described in Section 9.1; (11) deposit of \$3,000,000 into the WAF more particularly described in Section 9.2 A; and (12) deposits to an escrow account solely administered by PG&E in a total amount of \$2,137,100 as compensation for 10% of the prescribed instream flow releases listed in Attachment 1 and estimated cost of foregone power during construction. Instructions will be developed by the Parties identifying the timing of such deposits of funds based upon loss of generation due to scheduling for construction outages, decommissioning of facilities, commencement of prescribed instream flow releases, or execution of deeds or other mutually agreed upon documents for transfer of water rights pursuant to Section 6.1 E. PG&E will withdraw funds from this escrow account after the CPUC determines the market valuation for the FERC Project No. 1121.

10.3 PG&E Cost Sharing

PG&E's participation in the Restoration Project is an estimated \$20,550,900 toward the Total Project Cost. This amount includes: (1) assumption of ninety percent (90%) of the foregone energy production resulting from the prescribed instream flow releases listed in Attachment 1; (2) assumption of all costs due to increased operation and maintenance at remaining hydropower facilities; (3) assumption of all incremental losses due to Ramping Rate requirements listed in Attachment 2; (4) assumption of all costs for screen and ladder repairs and replacements due to normal wear and tear, catastrophic damage, and any other damage; (5) assumption of costs for facility monitoring described in Section 7.2; (6) assumption of all internal costs associated with any FERC license

amendment necessary to implement the Restoration Project; (7) assumption of internal costs associated with providing limited technical and fishery expertise in developing and implementing the biological and environmental monitoring described in Section 7.3; and (8) assumption of all internal costs associated with the joint petition described in Section 6.1 E.

10.4 Third Party Donor(s) Funding

A third party donor(s) will provide a one-time lump sum payment of \$3,000,000 to establish the AMF. As described in Section 9.2 B, the third party donor(s) will place these funds in an interest-bearing account and make provision for payments from the account for recommended actions based on the AMP and the AMF protocols, referenced herein, in a separate agreement to be developed by the Parties and the third party donor(s).

11.0 LEASES OR SALE OF FERC PROJECT NO. 1121

PG&E agrees that any legal instrument conveying some or all of its interest in FERC Project No. 1121 to a successor in interest will include an obligation to assume PG&E's responsibilities and obligations under this MOU. PG&E further agrees that such obligations will run with the FERC Project No. 1121 and be binding on all subsequent owners.

12.0 ENVIRONMENTAL LIABILITIES

Investigations conducted during the design phase will include such surveys as determined necessary and appropriate by the TT (described in Section 8.2 C) to identify any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (hereinafter "CERCLA"), 42 U.S.C. Sections 9601-9675, that may exist in, on, or under lands, easements, and rights-of-way that are determined to be required for the construction, operation, and maintenance of the Restoration Project. In the event it is discovered through any investigation, construction activity, or other means that hazardous substances regulated under CERCLA exist at levels designated as hazardous waste in, on, or under any lands, easements, or rights-of-way to be required for the construction, operation, or maintenance of FERC Project No.

1121, PG&E and USBR shall notify each other and the other Parties, and work shall not proceed until all Parties agree that activities should continue.

If a structure, system, or component of FERC Project No. 1121 does not currently constitute a hazardous waste, but becomes one as a result of Restoration Project decommissioning activities, the costs associated with that liability will be considered included in the federal share of the Total Project Cost. For example, piping in service not considered a hazardous liability under CERCLA may become a liability under CERCLA upon removal. Consequently, such costs for proper disposal shall be included in the federal portion of the Total Project Cost. Conversely, a concrete pad which has been previously contaminated by a hazardous waste requiring special handling or disposal resulting in increased costs shall not be included in the federal share of the Total Project Cost.

Notwithstanding any potential liability of PG&E, or any other potentially responsible party, for hazardous wastes regulated under CERCLA, the PMT may agree to include certain costs related to such hazardous wastes in the Total Project Cost.

The Parties, through the PMT (described in Section 8.2 A), shall determine whether to initiate construction of that Restoration Project feature, or if already in construction, whether to continue with such work, suspend future performance under this MOU, or terminate this MOU, in any case where hazardous substances regulated under CERCLA are found to exist. Should the Parties determine to initiate or continue with construction after considering any liability that may arise under CERCLA, PG&E, the landowner, or any other potentially responsible party shall be responsible for the costs of any studies and investigations necessary to determine an appropriate response to the contamination. Such costs shall not be considered a part of Total Project Costs.

PG&E and the Parties shall consult with each other in accordance with other provisions of this MOU in an effort to ensure that responsible parties bear any necessary cleanup and response costs as defined in CERCLA. Any decision made pursuant to this Section shall not relieve any third party from any liability that may arise under CERCLA. PG&E shall be considered the operator of this Restoration Project for purposes of CERCLA liability. To the maximum extent practicable, PG&E shall operate, maintain, repair, replace, and rehabilitate the

Restoration Project in a manner that will not cause liability to arise under CERCLA.

13.0 AMENDMENT PROCESS

No amendment or modification of this MOU, nor waiver of any provision of this MOU, shall be effective unless set forth in a written instrument or instruments executed by duly designated and authorized representatives of the Parties with the same formality of this MOU.

14.0 DISPUTE RESOLUTION

In the event any one of the Parties to this MOU believes there is an issue regarding the interpretation of, or compliance with, any provision of this MOU, other than an issue involving determining protocols for funding prescribed instream flow release increases utilizing the Water Acquisition Fund or the Adaptive Management Fund, that Party shall provide written notice of that issue to each of the other Parties. The Parties will then meet within thirty (30) days of the written notice, or at a later date by mutual agreement, in an effort to resolve the issue. If resolution is not achieved, PG&E and the Agencies (collectively) will each choose a person, and together those two persons will choose a single third party who will act as mediator. PG&E and the Agencies shall make their respective choice within fourteen (14) days from the date of any determination that resolution has not been achieved, and the third party mediator shall be chosen no later than forty-five (45) days from such date of determination that resolution has not been achieved. These times may be extended by mutual agreement of the Agencies and PG&E. If resolution through non-binding mediation is still not achieved, the Agencies and PG&E shall petition FERC to resolve the subject dispute for those actions within FERC's jurisdiction. Any such petition shall include the administrative record of the mediation process. Agencies and PG&E will be responsible for assuming their respective costs for any such FERC process. For those issues falling outside the scope of FERC's jurisdiction, where any one of the Parties fails to achieve resolution through the dispute resolution process described above, then any one of the Parties may seek any available appropriate administrative and/or judicial remedies.

15.0 TERM

This MOU shall be effective upon the last date of execution indicated in Section 17.0 and will continue in effect until the expiration of the license for FERC Project No. 1121, or July 31, 2026, whichever is earlier except as otherwise provided in the MOU.

16.0 TERMINATION

16.1 Except as provided in Section 16.2, no Party may withdraw from or terminate its participation in this MOU prior to the issuance of a Final FERC Order except by Consensus.

16.2 PG&E or the Agencies may elect to withdraw from the MOU, after providing written notice to the other Parties and making a good faith effort to resolve concerns related to the following occurrences:

- Public and third party donor(s) funding, either from CALFED, CVPIA, CAMP, or other sources, is not adequate to fund all Agencies' commitments;
- Third party donor(s) fund is not established pursuant to Sections 9.2 B and 10.4;
- The Agencies do not support the FERC license amendment application developed from the terms of this MOU;
- FERC approval of the license amendment application is not granted;
- The Final FERC Order, as defined in Section 2.13, is materially different from the terms and conditions of the MOU;
- Any necessary CPUC approval is not granted;
- Any necessary CPUC action contains terms that are materially different from the terms and conditions of this MOU; or
- PG&E abandons the license for FERC Project No. 1121.

17.0 SIGNATURES

This MOU may be executed in counterparts. A copy with all original executed signatures attached will be retained by USBR. USBR will distribute copies of the MOU with executed signature pages to all Parties to this MOU. Each Party hereby represents and warrants that the person executing this MOU on behalf of such Party has been duly authorized to do so.

IN WITNESS WHEREOF, the Parties have caused this MOU to be executed as of the last date written below:

Signatory	Date
_____ Kirk C. Rodgers, Acting Regional Director U.S. Bureau of Reclamation	_____
_____ Wayne S. White, Field Supervisor U.S. Fish and Wildlife Service	_____
_____ Rodney R. McInnis, Acting Regional Administrator, Southwest Region National Marine Fisheries Service	_____
_____ Robert Hight, Director California Department of Fish and Game	_____
_____ E. James Macias, Senior Vice President Pacific Gas and Electric Company	_____

FINAL AGREEMENT IN PRINCIPLE:

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT

The signatories below agree that the following table entitled, FINAL AGREEMENT IN PRINCIPLE: BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT, accurately describes the consensus proposal negotiated on January 26, 1999.

Negotiator

Date

Mark Stopher
Mark Stopher,
California Department of Fish and Game

2/9/99

Jim Bybee
Jim Bybee,
National Marine Fisheries Service

2-9-99

Terry Morford
Terry Morford,
Pacific Gas and Electric Company

2-16-99

Brent Walthall
Brent Walthall,
US Bureau of Reclamation

2/9/99

Wayne White
Wayne White,
US Fish and Wildlife Service

2/11/99

FINAL AGREEMENT IN PRINCIPLE

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT

Feature **1/26/99 Consensus Proposal, subject to PG&E Management Approval, FERC license amendment, and Resource Agency/PG&E MOU Supporting All Facility and Instream Flow Changes Outlined Below**

Facilities	Decommission Wildcat, Coleman, Soap Creek, Lower Ripley and South Diversion Dams and associated water conveyance facilities that will no longer be in service; screen and ladder N. Battle Creek Feeder, Inskip and Eagle Canyon Diversion Dams; install tailrace connectors and water bypass facilities at Inskip and South Powerhouses. PG&E, or its successor(s) (Project Owner) agrees to support installation of the connector at South Powerhouse concurrent with, or prior to, the Inskip Diversion Dam Fish Screen.
Flows	See attached Tables 1 and 2 which list "Prescribed Instream Flow Releases." The Resource Agencies will meet and confer with Project Owner before determining flow ramping provisions for returning facilities to service following shutdowns.
Economic Variables	Adopt 12/98 CEC energy forecast & revise discount rate to 9.17%. Include all costs of proposal: O&M impacts, license amendment, all study costs associated with decommissioning, Facility Monitoring ¹ and Biological/Environmental Monitoring ² , a \$3 million Water Acquisition Fund, and a \$3 million Adaptive Management Fund (See Table 3 "Total Project Cost" and Table 4 "Summary of Assumptions").
Water Acquisition Fund Protocol	Water Acquisition Fund administered by Resource Agencies following consultation with appropriate interested parties. Water Acquisition Fund shall be placed in an escrow account and used solely for purposes of purchasing additional flows if the Resource Agencies determine such flows are necessary during the first 10 years of initiation of instream flow changes listed in Tables 1 and 2. During this first ten year period, payment to the Project Owner for agreed-upon instream flow changes will be made annually. After the first January 1 st following the expiration of the first 10 years of instream flow changes listed in Tables 1 and 2, all uncommitted funds would revert to CALFED; funds for instream flow changes agreed upon before the subject January 1 st which remain in effect after the subject January 1 st will be paid to the Project Owner in one lump-sum payment based on the net present value of foregone energy for the period inclusive of the realized increased flows and expiration date of the current FERC license. Protocols to determine appropriate flow changes for anadromous fish to be funded with the \$3 million Water Acquisition Fund will be developed in which both Resource Agencies and Project Owner make the determination through a consensus process. If consensus is not achieved, Project Owner and Resource Agencies (collectively) will each choose a person, and together those two persons will choose a single third party who will act as mediator. Each party shall make its choice within 14 days from the date of any determination that consensus has not been achieved, and the third party mediator shall be chosen by those parties no later than 45 days from such date of determination that consensus has not been achieved. These times may be extended by mutual agreement of the Resource Agencies and Project Owner. If consensus through mediation is still not achieved, the Resource Agencies and Project Owner reserve their right to petition FERC to resolve the subject action. Resource Agencies and Project Owner will be responsible for assuming their respective costs for FERC process. Interim flows will be provided by Project Owner until there is either consensus or FERC approval of the additional flows determined to be necessary by Resource Agencies. Water Acquisition Funds shall be used to implement consensually-agreed to or the FERC-approved actions, and interim actions which have been taken pending FERC action.

¹ FACILITY MONITORING includes verification that agreed-upon instream flows including ramping limitations are met, verify and document fish screen and ladder facilities continue to function as designed, i.e., report to FERC of screen and ladder outages, alarms, reasons for operational deviations, verify no gaps exceeding design criteria exist in the fish screen structure, perform periodic inspections to verify screen is being properly maintained and site conditions have not significantly changed, having the Owner's operator note any fish stacking below the fish ladders and fish passing up the ladder.

² BIOLOGICAL/ENVIRONMENTAL MONITORING includes anadromous fish survey (i.e., abundance, distribution and timing of adult and juvenile fish), water quality/meteorology, barrier formation, long-term fish passage at fish passage facilities.
SPH clean 4 PGETAB5

**FINAL AGREEMENT IN PRINCIPLE
BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT**

1/26/99 Consensus Proposal, subject to PG&E Management Approval, FERC license amendment, and Resource Agency/PG&E MOU Supporting All Facility and Instream Flow Changes Outlined Below

<p>Adaptive Management Fund Protocol</p>	<p>Adaptive Management Fund administered by Resource Agencies following consultation with appropriate interested parties³. Adaptive Management Fund shall be placed in an escrow account and used solely for Battle Creek salmon and steelhead restoration purposes directly associated with the facilities and operations of FERC Project No. 1121, i.e., instream flow changes (after exhaustion or termination of the Water Acquisition Fund), and facility modifications; all uncommitted funds will revert to the third party at the end of the current FERC license term.</p> <p>Protocols to determine appropriate actions that benefit anadromous fish to be funded with the \$3 million Adaptive Management Fund will be developed in which both Agencies and Project Owner make the determination through a consensus process. For funding instream flow changes, the protocol would be the same as for the Water Acquisition Fund discussed above. For funding facility modifications, the protocol would be the same as for the Water Acquisition Fund discussed above with 2 exceptions: 1) no interim actions would be implemented prior to FERC action; and 2) for all FERC resolved actions, the Adaptive Management Fund would contribute a maximum of 60 percent of any resulting facility modification cost. In other words, for actions related to facility modifications, funds from the Adaptive Management Fund shall be used to implement 100% of the costs of consensually-agreed to actions but only 60% of the costs of actions submitted to FERC for resolution, the remaining 40% to be borne by the Project Owner in the latter case.</p>
<p>Total Cost</p>	<p>\$50.7 million (includes \$1 million CALFED-funded monitoring; additional monitoring funding to be provided by others i.e., CVPIA, CAMP, etc.)</p>
<p>Payment to Project Owner</p>	<p>\$2.1 million</p>
<p>Resource Agency Cost Sharing</p>	<p>Public funding for: all screens, ladders, connectors, decommissioning, decommissioning studies, start-up and acceptance testing prior to transferring ownership and operations and maintenance responsibilities to Project Owner, construction and decommissioning over-runs, environmental permitting (i.e., all necessary environmental permitting (e.g., NEPA/CEQA), including additional FERC-required decommissioning studies), all Biological/environmental monitoring (except for Owner's limited participation and use of internal technical and fishery expertise to jointly develop Agencies' monitoring plan, assist in analyses, review results and identify potential adaptive management measures), and Water Acquisition Fund; 10% of Purchased Water Costs.</p>
<p>Resource Agency Contribution</p>	<p>\$27.2 million = 54%. Includes portion of Biological/Environmental Monitoring³; other governmental funding sources (CVPIA, CAMP) will be used for monitoring.</p>
<p>Third Party Cost Sharing</p>	<p>Third Party funding for \$3 million Adaptive Management Fund</p>
<p>Third Party</p>	<p>\$3 million = 6%</p>

³ An Adaptive Management Plan will be developed to contribute to the sustainability of naturally spawned anadromous salmonids and the associated ecosystem of Battle Creek affected by FERC Project No. 1121 facilities or operations. The Adaptive Management Plan will be developed by consensus. The Adaptive Management Plan will develop a broadly applicable and flexible framework for an adaptive management program specific to impacts resulting from FERC Project No. 1121 facilities or operations and will include: establishing objectives; planning for unanticipated outcomes; recognizing appropriate time frames for resource management and recovery; defining the role of assessment monitoring; developing general procedures for prioritizing expenditures of Adaptive Management Funds; and developing general procedures for modifying management approaches using new scientific data. The Adaptive Management Plan will implement specific actions to protect, restore, enhance, and monitor salmonids and salmonid habitat, at FERC Project No. 1121, to guard against straying and to ensure that salmon and steelhead fully access and utilize available habitat in a manner that benefits all life stages and thereby maximizes natural production, fully utilizing ecosystem carrying capacity. The Adaptive Management Plan may also include measures to minimize impacts of Project operations upon life stages of salmon and steelhead.

FINAL AGREEMENT IN PRINCIPLE

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT

1/26/99 Consensus Proposal, subject to PG&E Management Approval, FERC license amendment, and Resource Agency/PG&E MOU Supporting All Facility and Instream Flow Changes Outlined Below

<p>Contribution</p>	
<p>Project Owner Cost Sharing</p>	<p>Project Owner funding for: 90% of Purchased Water Costs; 100% of increased O&M, foregone power due to ramping rate requirements and periodic screen and ladder repairs, and replacements due to normal wear-and-tear and catastrophic damage. Screen and ladder modifications and replacements due to changes in design to improve biological effectiveness which meet NMFS adopted criteria will be paid from the Adaptive Management Fund; Facility Monitoring¹ to verify flows are provided as agreed, and screens and ladders continue to function as designed. Project Owner pays all internal costs associated with FERC license amendment and Facility Monitoring¹ (Biological/Environmental Monitoring² including overall effectiveness of modifications, fish population and distribution monitoring which is beyond Project Owner Facility Monitoring¹ requirements will be paid by CALFED. Owner shall participate in and provide limited internal technical and fishery expertise to the Agencies' Biological/Environmental Monitoring² program at its own cost.)</p>
<p>Project Owner Contribution</p>	<p>\$20.6 million = 40% includes limited portion of Biological/Environmental Monitoring²</p>
<p>Assurances and Requirements (to be stipulated in MOU and provided through ESA permits and FERC license)</p>	<p>Project Owner will voluntarily reopen its FERC license through the license amendment process to enhance the Battle Creek fishery as described in the MOU and related agreements. The Resource Agencies agree to: 1) support project owner's FERC license amendment to incorporate the restoration actions described herein into FERC License No. 1121, and 2) support the position that FERC focus this license amendment on the restoration actions described herein in order to streamline the process for a FERC decision to allow Battle Creek restoration to go forward in a timely manner.</p> <p>No ESA assurances.</p> <p>Water Acquisition Fund provided by CALFED and administered by Agencies to pay for any additional future flow changes for salmon and steelhead restoration purposes directly associated with the facilities and operations of FERC Project No. 1121 pursuant to the above-mentioned protocols.</p> <p>Adaptive Management Fund provided by Third Party and administered by Agencies to pay for any additional future salmon and steelhead restoration purposes directly associated with the facilities and operations of FERC Project No. 1121 pursuant to the above-mentioned protocols.</p> <p>Water diversion rights associated with all dams to be decommissioned will be transferred to the appropriate party (CDFG, NMFS, USFWS). Based on the assumption that all PG&E water rights on the South Fork of Battle Creek have an equal priority, water rights transferred to Agencies will not be used by the Agencies to increase bypass flows above the amounts specified in the MOU, or developed pursuant to the Adaptive Management Program. If FERC License No 1121 is abandoned, then the limitation regarding transferred water rights would no longer apply. Project Owner and the Resource Agencies, or their designee, will file a Petition with the SWRCB pursuant to Water Code 1707 to preserve and enhance instream flows.</p> <p>Project Owner and the Resource Agencies, or their designee, agrees to support such a petition.</p> <p>Water associated with meeting the prescribed flow schedules below all dams screened and laddered plus Baldwin Creek will be included in the FERC license amendment in order to maintain fish and wildlife resources. Additionally, Project Owner and the Resource Agencies will execute an agreement ensuring that the currently agreed-upon bypass and ramping flows at each remaining dam, and any agreed-upon future changes to those flows, resulting from the adaptive management program developed in the MOU, will be provided by Project Owner until the end of the current FERC license and any subsequent annual licenses. This commitment to provide bypass and ramping flows may be subject to change by FERC at the expiration of the current license term in 2026. Project Owner and Resource Agencies (subject to State and Federal laws) agree to support the continuation of such bypass and ramping flows, resulting from the adaptive management program developed in the MOU, and any agreed upon future changes to those flows, in any relicensing proceeding for FERC License No. 1121.</p> <p>The Parties agree that for the term of the license, and any subsequent annual licenses, the flows developed by the Adaptive Management Program will not be lower than those flows specified in attached Tables 1 and 2 (to be incorporated in MOU) unless agreed to by the Resource Agencies.</p>

FINAL AGREEMENT IN PRINCIPLE

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT

1/26/99 Consensus Proposal, subject to PG&E Management Approval, FERC license amendment, and Resource Agency/PG&E MOU Supporting All Facility and Instream Flow Changes Outlined Below

Feature

Screening and Laddering Requirements for N. Battle Creek Feeder, Inskip and Eagle Canyon diversions.

Diversion dams would need to be equipped with NMFS/CDFG approved "fail-safe" fish screens and ladders. The diversions would require full closure during screen failure and year-round remote sensing and inspection to monitor performance.

FINAL AGREEMENT IN PRINCIPLE
BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT
1/26/99 Consensus Proposal, subject to PG&E Management Approval, FERC license amendment, and Resource Agency/PG&E MOU Supporting All Facility and Instream Flow Changes Outlined Below

Table 1. Summary of prescribed instream flow releases from dams in the anadromous reaches of the North and South forks of Battle Creek based on modeled biological optimums determined by the Battle Creek Working Group Biological Team

Dam	Fork	Monthly Minimum Flow (cfs) To Be Released From Dam													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Keswick	North	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A	3 ^A
NBCF	North	88 ^F	88 ^F	88 ^F	67 ^F	47 ^F	47 ^F	47 ^F	47 ^F	47 ^F	47 ^F	47 ^F	47 ^F	47 ^F	88 ^F
Eagle	North	46 ^S	46 ^S	46 ^S	46 ^S	35 ^S	35 ^S	35 ^S	35 ^S	35 ^S	35 ^S	35 ^S	35 ^S	35 ^S	46 ^S
Wildcat	North	(Facility decommissioned; no instream flow requirement)													
South	South	(Facility decommissioned; no instream flow requirement)													
Inskip	South	86 ^{P1}	86 ^{P1}	86 ^{P1}	61 ^{P1}	40 ^{P1}	40 ^{P1}	40 ^{P1}	40 ^{P1}	40 ^{P1}	40 ^{P1}	40 ^{P1}	40 ^{P1}	40 ^{P1}	86 ^{P1}
Coleman	South	(Facility decommissioned; no instream flow requirement)													

- A = Accretion flows downstream of the Keswick Dam can exceed 100% of maximum WUA for steelhead spawning in the portion of the Keswick reach available to anadromous fish and can exceed the predictive capability of the IFIM model. Accretion flows downstream of the Keswick Dam provide >90% of maximum WUA for steelhead rearing in the portion of the Keswick reach available to anadromous fish.
- F = On occasion the release is not attainable due to the quantity of inflow reaching North Battle Creek Feeder Diversion. Additional inflows to the North Battle Creek Feeder reach are occasionally received from the junction box of the Volta 2 Powerhouse tailrace and Cross-County Canal a short distance downstream.
- S = Eagle Canyon Dam releases reported in this table include releases from Eagle Canyon Springs (those springs located downstream of Eagle Canyon Dam that were included in the "interim flow agreement" between PG&E and USBR; USBR 1998a).
- P1 = The prescribed instream flow will be the total available inflow in the South Fork upstream of the South Powerhouse at times when the available inflow is less than the prescribed flow.

FINAL AGREEMENT IN PRINCIPLE

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT

Feature **1/26/99 Consensus Proposal, subject to PG&E Management Approval, FERC license amendment, and Resource Agency/PG&E MOU Supporting All Facility and Instream Flow Changes Outlined Below**

Table 2. Summary of prescribed instream flow releases from diversions in tributaries affecting the anadromous reaches of Battle Creek and tributaries based on best available information by the Battle Creek Working Group Biological Team.

Diversion	Monthly Minimum Flow (cfs) To Be Released From Tributary Diversions											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eagle Canyon Spring	AIIP	AIIP	AIIP	AIIP	AIIP	AIIP	AIIP	AIIP	AIIP	AIIP	AIIP	AIIP
Soap Creek	(Facility decommissioned; no instream flow requirement)											
Lower Ripley Creek	(Facility decommissioned; no instream flow requirement)											
Baldwin Creek	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c	5 ^c

D = Flow from Eagle Canyon Springs enters Battle Creek in the vicinity of Eagle Canyon Dam and is included in Eagle Canyon Dam releases shown on Table 1. These Springs are limited to those that were included in the "interim flow agreement" between PG&E and USBR will be released to maximize cooling of Battle Creek.

C = The flow value reported for Baldwin Creek represents the maximum instream flow release.

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT
1/26/99 Consensus Proposal

Table 3 - Total Project Cost

	Total Cost	CALFED/ Agencies Share	PG&E Share	Third Party Share
Capital Costs				
North Battle Creek Feeder Diversion Dam				
Fish Screen (55 cfs)	\$585,000	\$585,000	\$0	\$0
Fish Ladder	\$630,000	\$630,000	\$0	\$0
Eagle Canyon Diversion Dam				
Fish Screen (70 cfs)	\$1,098,000	\$1,098,000	\$0	\$0
Fish Ladder	\$1,028,000	\$1,028,000	\$0	\$0
Wildcat Diversion Dam				
Decommission	\$3,000,000	\$3,000,000	\$0	\$0
Soap Creek Feeder				
Decommission	\$200,000	\$200,000	\$0	\$0
Lower Ripley Creek Feeder				
Decommission	\$100,000	\$100,000	\$0	\$0
South Diversion Dam				
Decommission	\$3,300,000	\$3,300,000	\$0	\$0
Inskip Diversion Dam				
Fish Screen (220 cfs)	\$1,500,000	\$1,500,000	\$0	\$0
New Fish Ladder	\$1,050,000	\$1,050,000	\$0	\$0
Tailrace Connector from South PH to Inskip Canal (Includes South PH Bypass)	\$4,000,000	\$4,000,000	\$0	\$0
Coleman Diversion Dam				
Tailrace Connector from Inskip PH to Coleman Canal (300 cfs)	\$2,600,000	\$2,600,000	\$0	\$0
Inskip PH Bypass (Preliminary estimate, value engineering analysis required.)	\$1,000,000	\$1,000,000	\$0	\$0
Decommission	\$930,000	\$930,000	\$0	\$0
Total Capital Costs¹	\$21,021,000	\$21,021,000	\$0	\$0
Environmental Permitting and Monitoring Costs²	\$1,500,000	\$1,000,000	\$500,000	\$0
Water Acquisition Fund³	\$3,000,000	\$3,000,000	\$0	\$0
Adaptive Management Fund⁴	\$3,000,000	\$0	\$0	\$3,000,000
Net Present Value of O&M Impacts⁵	\$817,000	\$0	\$817,000	\$0
Cost of Foregone Power During Construction⁶	\$544,000	\$54,400	\$489,600	\$0
Net Present Value of Annual Foregone Power⁷	\$20,827,000	\$2,082,700	\$18,744,300	\$0
TOTAL PROJECT COST⁸	\$50,709,000	\$27,158,100	\$20,550,900	\$3,000,000
Cost Share		54%	40%	6%

¹ The Resource Agencies are responsible for the costs of all screens, ladders, connectors and decommissioning. The Resource Agencies are responsible for any construction costs in excess of those noted in this budget. Any funds budgeted for capital costs that are not expended will be returned to CALFED at the completion of all construction.

² The Resource Agencies assume responsibility for completion of environmental permitting (e.g., NEPA/CEQA), including additional decommissioning studies, and for continued environmental monitoring. PG&E will maintain responsibility for Facility monitoring and internal FERC license amendment costs. Additional costs associated with this ongoing activity will be borne by the Resource Agencies through other funding sources (CVPIA, CAMP, etc...)

³ The Resource Agencies will place \$3 million in an escrow fund that can be used for the purchase of additional stream flows, in the event that an adaptive management review determines that additional flows are required for anadromous fish recovery. These funds may also be used to fund any necessary studies that determine the adequacy of flows. They may not be used for any capital costs (i.e., facility repair). The escrow fund will remain in place through 2011, at which time any uncommitted funds will be returned to CALFED.

⁴ A \$3 million Adaptive Management Fund will be established by a third party. This money will be held in an escrow account that will remain in place until the expiration of the current FERC license (2026), at which time any unused funds will be returned to the third party benefactor.

⁵ PG&E is responsible for all future O&M and periodic screen and ladder repair and replacement.

⁶ Responsibility for the cost of foregone power during construction are split with PG&E (90%) and the Resource Agencies (10%).

⁷ Responsibility for the cost of foregone power are split with PG&E (90%) and the Resource Agencies (10%).

⁸ The Resource Agencies' share of the total project cost is \$27.2 million (54%). PG&E's share of the total project cost is \$20.6 million (40%). Third party share of the total project cost is \$3.0 million (6%).

Flow Ramping Criteria

When returning the water conveyance facilities listed below to service, following forced or scheduled outages where the available diversion flow has been released to the natural stream channel, the following criteria will govern the maximum rate at which water is diverted from the stream channel back into the conveyance system:

Season	Ramping Rate*
Year Round	0.10 ft./hour

- * Modification of method described in “Hydropower Flow Fluctuations and Salmonids: A Review of the Biological Effects, Mechanical Causes, and Options for Mitigation by Mark A. Hunter, State of Washington Department of Fisheries, September 1992.”

It may be feasible to establish a threshold criteria of flow and stage above which ramping will not be required. An analysis of existing instream flow methodology data, stream cross-section information, and field observations will be conducted and recommendations made for initial threshold criteria within 90 days of the effective date of this MOU.

Monitoring of stream stage for ramping purposes will be at a confined, (i.e., narrow) stream transect immediately below the diversion point for the conveyance facility being returned to service, or at another appropriate location at the facility if a suitable transect is not available immediately below the diversion point.

Water conveyance facilities covered by these provisions are:

North Battle Creek Feeder
 Cross-Country Canal
 Eagle Canyon Canal
 Inskip Canal
 Coleman Canal

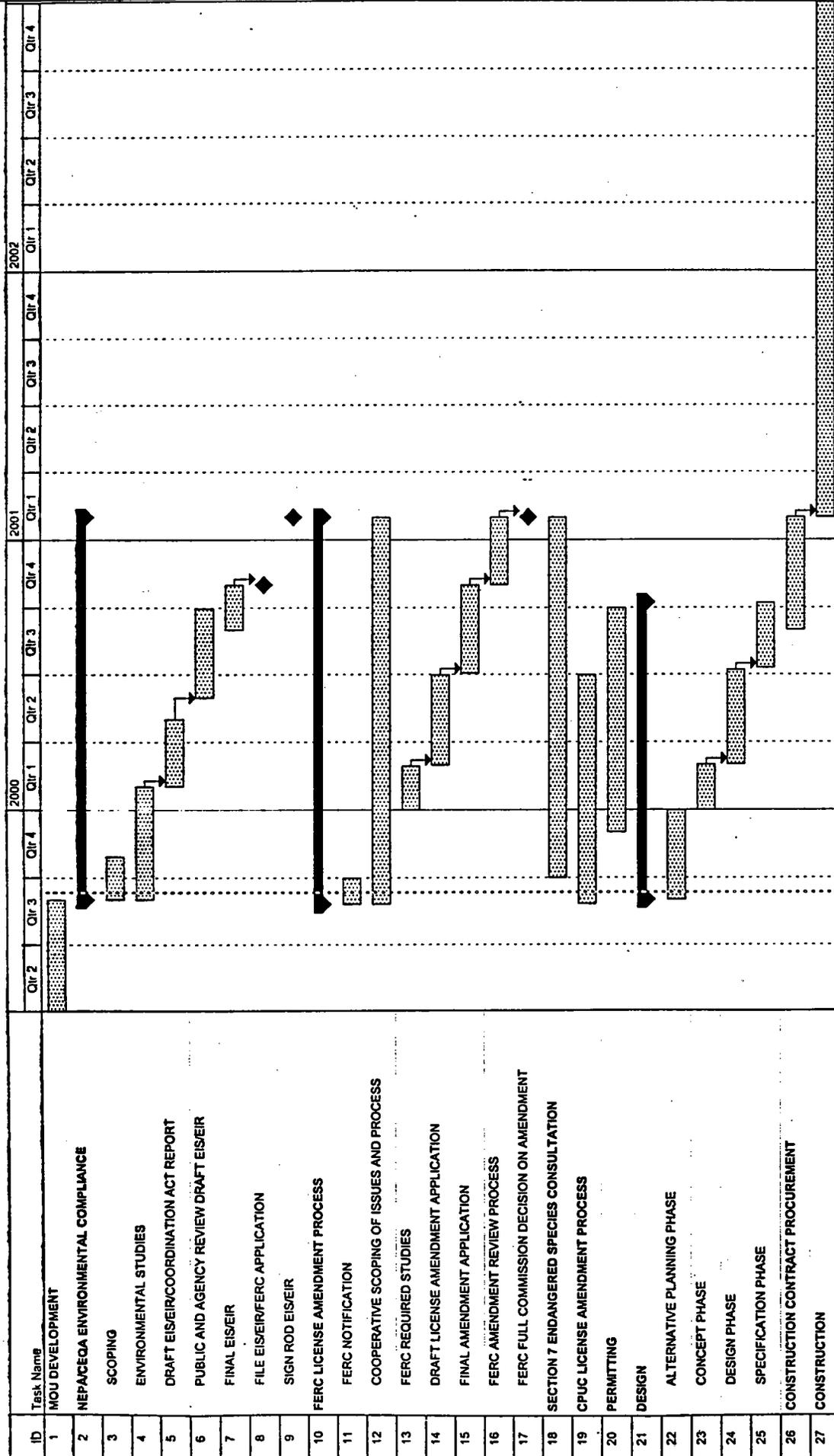
Planned maintenance requiring dewatering of these conveyance facilities will be scheduled during the period of February 1 through April 30 in order to minimize potential effects on anticipated anadromous fishery life stages that may be present in the affected stream reaches. Duration of the actual outages will be that necessary to complete the work associated with the conveyance facility itself.

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT
1/26/99 Consensus Proposal

Table 4 - Summary of Assumptions

1	"Prescribed Instream Flow Releases" are used (See Attached Tables 1 and 2)
2	Soap Creek Feeder is decommissioned.
3	Lower Ripley Creek Feeder is decommissioned.
4	Wildcat Diversion and Canal are decommissioned.
5	Eagle Canyon Diversion is screened and laddered.
6	South Diversion and Canal are decommissioned.
7	Coleman Diversion is decommissioned with a tailrace connector from Inskip PH and water bypass facility.
8	A tailrace connector and water bypass are constructed between South PH and Inskip Canal that also allows up to 220 cfs intake from the South Fork, when such flows are available (see "Prescribed Instream Flow Releases" listed on Attached Tables 1 and 2).
9	Generation foregone due to construction is estimated based on PG&E estimates.
10	Capital costs are assumed to be borne at the time of occurrence. Thus, those costs are shown in 1999 dollars, but may increase due to inflation at the time of construction.
11	The current 10-year market clearing price forecast developed by the CEC in December 1998 was used to estimate foregone power costs. Annual escalation of 2.8% was assumed starting in 2009.
12	Transmission delivery losses are estimated at 2.0% of generation.
13	Maintenance and forced outage losses are estimated at 3.0% of full generation potential.
14	It is assumed that 100% of generation (adjusted for losses) is dispatched into the market.
15	Annual operation and maintenance (O&M) costs are currently estimated by PG&E.
16	The period of analysis is from 1/1/01 through 12/31/26.
17	A 2.5% inflation rate is assumed for O&M costs.
18	The discount rate used is 9.17%, and is intended to reflect a rate consistent with PG&E's weighted average cost of capital.

BATTLE CREEK SALMON AND STEELHEAD RESTORATION PROJECT ESTIMATED SCHEDULE



Task Split Progress

Milestone Summary Rolled Up Task

Rolled Up Split Rolled Up Milestone Rolled Up Progress

External Tasks Project Summary

Project: Battle Creek Restoration Proj
 Date: Thu 6/10/99

Appendix B

Documentation Associated with the Interim Flow Agreement

Letter to PG&E Regarding Fish Ladder Closures, May 14, 2001

Letter to PG&E Regarding Water Diversions, March 21, 2002

Four-Agency Statement Regarding Release of Steelhead Above Coleman Dam

**Letter to PG&E Regarding Fish Ladder Closures,
May 14, 2001**



**U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846**



**National Marine Fisheries Service
Protected Resources Division
650 Capitol Mall, Suite 8-300
Sacramento, California 95814-4706**



**California Department of Fish and Game
Northern California-North Coast Region
601 Locust Street
Redding, California 96001**

May 14, 2001

Ms. Angela Risdon
Senior License Coordinator
Pacific Gas and Electric Company
Mail Code N11C
P.O. Box 770000
San Francisco, California 94177

Subject: Battle Creek Hydroelectric Project No. 1121, Shasta and Tehama Counties, California. Request to Continue Fish Ladder Closures

Dear Ms. Risdon:

The U.S. Fish and Wildlife Service, National Marine Fisheries Service, and California Department of Fish and Game concur with the Pacific Gas and Electric Company's (PG&E) request to the Federal Energy Regulatory Commission to continue blocking the downstream entrances to the fish passage facilities (fish ladders) at the Eagle Canyon and Coleman diversion dams and suspending diversion flows into Wildcat Canal until the end of 2001 or until a new short-term agreement is in place, whichever comes first. It is expected that the new short-term agreement will be similar to the last agreement, including the same fish ladder closures, suspension of the Wildcat Dam diversion, and augmentation of flows.

The last short-term agreement providing for these actions was in effect from November 17, 1998 through February 28, 2001, and is now expired along with a preceding 3-year agreement. These previous short-term agreements were put in place until a long-term restoration agreement for the hydroelectric project can be implemented through the environmental regulatory process, including National Environmental Policy Act and California Environmental Quality Act compliance and a hydropower license amendment, for the Battle Creek Salmon and Steelhead Restoration Project.

Closing the fish ladders over the past four years was combined with flow augmentation, water temperature improvements, and entrainment preventions to restore anadromous and resident fish habitat in 17 miles of stream. Discontinuing that habitat restoration now would jeopardize the accumulating fishery benefits, which are a significant financial investment. The fish produced over

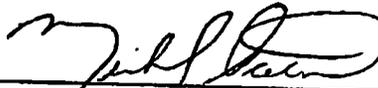
May 14, 2001

the last 4 years will be needed to seed 42 miles of habitat that is intended to be restored under the Battle Creek Salmon and Steelhead Restoration Memorandum of Agreement between the resource agencies and PG&E. The fish ladder closures concentrate the relatively small annual numbers of adult anadromous fish in the safest habitat that can be afforded on an interim basis. The habitat below the closed ladders is the coldest, largest amount of usable habitat that is entrainment free. Suspension of diversion flows into Wildcat Canal provides increased flows downstream of the Wildcat Diversion Dam, which results in improved water temperatures and increased habitat area to the benefit of fisheries and the overall aquatic and riparian environment.

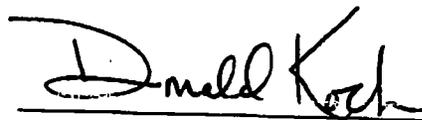
If you have any questions or comments, please contact Bart Prose of the U.S. Fish and Wildlife Service (916) 414-6600, Mike Tucker of the National Marine Fisheries Service (916) 930-3600, or Harry Rectenwald of the California Department of Fish and Game (530) 225-2300.



Wayne J. White
Field Supervisor
U.S. Fish and Wildlife Service



Mike Aceituno
Central Valley Team Leader
National Marine Fisheries Service



Donald Koch
Regional Manager
California Department of Fish and Game

cc: David P. Boergers, Federal Energy Regulatory Commission
Thomas J. LoVullo, Federal Energy Regulatory Commission
Randal S. Livingston, PG&E

**Letter to PG&E Regarding Water Diversions,
March 21, 2002**



U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

National Marine Fisheries Service
Protected Resources Division
650 Capitol Mall, Suite 8-300
Sacramento, California 95814-4706

California Department of Fish and Game
Northern California-North Coast Region
601 Locust Street
Redding, California 96001

March 21, 2002

Ms. Angela Risdon, Senior License Coordinator
Pacific Gas and Electric Company
Mail Code N11C
P.O. Box 770000
San Francisco, CA 94177

Dear Ms. Risdon:

Thank you for Pacific Gas and Electric Company's (PG&E's) continued cooperation and participation in the Battle Creek Interim Flow Agreement ("Interim Agreement") that temporarily modifies the operation of the Battle Creek Hydroelectric Project for the benefit of anadromous fish. The Bureau of Reclamation's 1998 environmental assessment titled: "Temporary Reduction in Water Diversions from Battle Creek" describes the project as it was implemented in the recent past. Now that the interim agreement supporting the project has expired, it is being revised along with its supporting environmental documentation. We appreciate PG&E's seamless continuation of the interim measures while the institutional arrangements are being completed to cover several more years of the operation under a new formal agreement.

The interim measures may include temporary reductions in water diversion at Coleman and Eagle Canyon dams and no diversion at Wildcat Dam. In addition, the diversion adjustments are coupled with temporary closures of the fish ladders at Eagle Canyon and Coleman diversion dams. These ladder closures confine the anadromous fish to the sections of habitat in Battle Creek that benefit from the reduced diversions in the Hydroelectric Project and prevent juvenile salmonids from becoming entrained into the open diversion canals above these dams. More complete descriptions of the benefits to biological resources are included in previous environmental documentation, monitoring results and agency correspondence relevant to the project. It is anticipated that the Interim Agreement will be replaced with a long-term restoration project (Battle Creek Salmon and Steelhead Restoration Project 1999) that significantly increases the quantity and quality of the habitat. However, because of the scale of the long-term

Ms. Angela Risdon
March 21, 2002
Page Two

project, it will be several years before all the necessary environmental documentation, decision making and construction activities are completed, leaving a continued need for the Interim Agreement.

The U.S. Fish and Wildlife Service, National Marine Fisheries Service, and California Department of Fish and Game concur with the need to continue the Interim Agreement including the related operation of temporarily closing the fish ladders at Coleman Dam and Eagle Canyon Dam. We look forward to continued cooperation in our joint efforts to restore salmon and steelhead habitat in Battle Creek.

If you have any questions or comments, please contact Mr. Bart Prose of the U.S. Fish and Wildlife Service at (916) 414-6606, Mr. Mike Tucker of the National Marine Fisheries Service at (916) 930-3600, or Mr. Harry Rectenwald of the California Department of Fish and Game at (530) 225-2368.

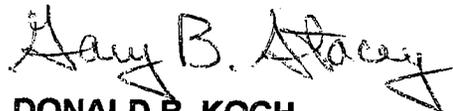
Sincerely,



for **WAYNE S. WHITE**
U.S. Fish and Wildlife



MICHAEL ACEITUNO
National Marine Fisheries Service



for **DONALD B. KOCH**
Department of Fish and Game

cc: See page three

Ms. Angela Risdon
March 21, 2002
Page Three

cc: Mr. Thomas J. Lo Vullo
Federal Energy Regulation Commission
888 First Street, NE
Washington DC 20426

Mr. Bart Prose
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
Sacramento, California 95828-1846

Mr. Mike Tucker
National Marine F Service
650 Capitol Mall
Sacramento, California 95814-4706

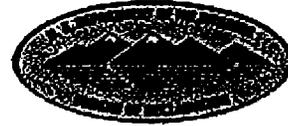
Mr. Harry Rectenwald
Department of Fish and Game
601 Locust Street
Redding, California

Mr. Dave Gore
U.S. Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95814

Four-Agency Statement Regarding Release of Steelhead Above Coleman Dam



FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, W-2605
Sacramento, California 95825-1846



BUREAU OF RECLAMATION
Mid-Pacific Region
2800 Cottage Way, E-1604
Sacramento, California 95825-1898



CALIFORNIA
DEPARTMENT OF FISH AND GAME.
601 Locust Street
Redding, California 96001



NATIONAL MARINE FISHERIES SERVICE
650 Capitol Mall, Suite 8-300
Sacramento, California 95814

October 31, 2002

On September 24, 2002, a consensus decision was reached among the signatory agencies of this letter to release adult hatchery-origin steelhead above the Coleman National Fish Hatchery (NFH) during the 2002 - 2003 migration and spawning season. After reviewing available information pertaining to this issue (see Enclosure), the National Marine Fisheries Service (NMFS), U.S. Bureau of Reclamation (USBR), California Department of Fish and Game (CDFG), and U.S. Fish and Wildlife Service (USFWS) concur that all hatchery-origin steelhead surplus to spawning needs at the Coleman NFH should be released upstream of the hatchery's barrier weir to supplement natural production in upper Battle Creek.

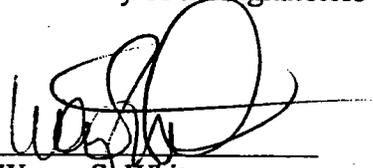
This decision was based on the fact that the potential benefits (population increases) of the action outweigh the potential (genetic) risks. Specifically, the action is expected to have a positive demographic effect by eventually increasing the number of naturally spawning steelhead in Battle Creek through utilization of currently underutilized spawning habitat above the barrier weir. With regard to genetic risks, the action of passing adult hatchery-origin steelhead above the weir is considered a low risk due to the high likelihood of genetic similarity between hatchery and natural-origin steelhead in the Battle Creek watershed (i.e., existing natural-origin steelhead in Battle Creek are likely the offspring of hatchery-origin adults passed above the weir in previous years).

During the process of passing adult steelhead above the Coleman NFH barrier weir, the current estimated spawning habitat carrying-capacity (3,700 total steelhead adults) will not be exceeded. The vast majority of

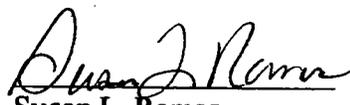
steelhead encountered at the Coleman NFH will be identifiable as hatchery-origin by the absence of an adipose fin. Since 1998, all juvenile steelhead released from Coleman NFH have been marked by removing (clipping) their adipose fin to identify them as hatchery-origin. Marked (hatchery-origin) steelhead returning to Coleman NFH that are surplus to spawning will be released above the hatchery's barrier weir to spawn naturally. Natural-origin steelhead encountered at Coleman NFH will also be released above the hatchery's barrier weir, with the exception of about 40 adults that will be spawned at the hatchery to maintain genetic diversity within the hatchery stock. In-season monitoring and reporting will assure carrying-capacity limits are not exceeded and priority will be given to the passage of natural-origin steelhead.

To address biological uncertainties associated with supplementing natural steelhead spawning in Battle Creek using hatchery steelhead from the Coleman NFH, a Monitoring and Evaluation (M&E) plan will be developed and incorporated into the Battle Creek Fishery Management Plan. The M&E plan will likely describe several facets of research and monitoring, such as: 1) investigation of ancestral relationship between hatchery and natural steelhead in Battle Creek; 2) assessment of relative fitness of hatchery and natural steelhead in Battle Creek; and 3) assessment of demographic effects of releasing large numbers of hatchery steelhead to reproduce naturally in Battle Creek. The M&E plan should also detail a strategy and time frame for phasing out the practice of releasing hatchery steelhead into upper Battle Creek. In anticipation of the plan and some of the data needs, tissue samples (fin) will be collected from all adult steelhead released upstream of the hatchery. A subset of these tissue samples will be initially be analyzed to determine ancestral relationship. Other biological data collected will include gender, length, and mark status (e.g., adipose fin clip), and scales will be collected to facilitate age determination.

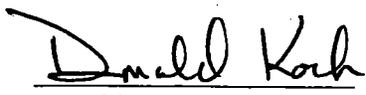
Please contact any of the signatories below with any questions related to this agreement.



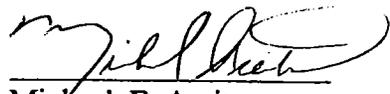
Wayne S. White
Field Supervisor
U.S. Fish & Wildlife Service
Sacramento, California



Susan L. Ramos
Assistant Regional Director
U.S. Bureau of Reclamation
Sacramento, California



Donald B. Koch
Regional Manager
California Department of Fish & Game
Redding, California



Michael E. Aceituno
Sacramento Area Office Supervisor
National Marine Fisheries Service
Sacramento, California

cc:

Jim Smith, USFWS, Red Bluff
Kevin Niemela, USFWS, Red Bluff
John Scott, USFWS, Anderson
Mike Keeler, USFWS, Anderson
Dale Pierce, USFWS, Sacramento
Mary Ellen Mueller, USFWS, Sacramento
Don Campton, USFWS, Abernathy Tech Center, WA
Ken Lentz, USBR, Sacramento
Dave Gore, USBR, Sacramento
Harry Rectenwald, CDFG, Redding
Mike Berry, CDFG, Redding
Randy Benthin, CDFG, Redding
Pat Overton, CDFG, Redding
Steve Turek, CDFG, Redding
Gary Stacey, CDFG, Redding
Mark Stopher, CDFG, Redding
Shirley Witalis, NMFS, Sacramento
Mike Tucker, NMFS, Sacramento
Carlos Garza, NMFS, ~~Tiburon~~ SANTA CRUZ
Diane Windam, NMFS, Sacramento
Battle Creek Watershed Conservancy, Manton

Enclosure:



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Coleman National Fish Hatchery Complex
24411 Coleman Fish Hatchery Road
Anderson, California 96007

PH (530) 365-8622

FAX (530) 365-0913

4 September 2002

Mr. Mike Aceituno
National Marine Fisheries Service
Protected Resources Division
650 Capital Mall, Suite 8-300
Sacramento, CA 95814-4706

Dear Mr. Aceituno:

As you are aware, personnel from the California Department of Fish and Game, U.S. Bureau of Reclamation, National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (Service) have been working together to develop a strategy to manage adult hatchery-origin steelhead surplus to broodstock needs at the Coleman National Fish Hatchery (NFH). In an attempt to reach a consensus decision on this issue, agency representatives have developed, discussed and evaluated twelve alternatives (one alternative to pass the adults above the Coleman NFH barrier weir in Battle Creek, and eleven alternatives that involve "non-passage" options). Although agency personnel have held highly productive meetings and have reduced the number of potential alternatives down to three (one passage and two "non-passage" alternatives), agency representatives have not reached agreement as to a final course of action.

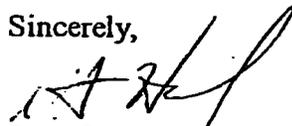
After additional discussion of this topic at a recent 4-Agency meeting (August 28, 2002), you requested that the Service submit a letter to NMFS justifying the proposal to pass the surplus hatchery-origin steelhead above the Coleman NFH barrier weir. To this end, in the enclosed document, a case is made which supports the action of passing adult surplus hatchery-origin steelhead above the Coleman NFH barrier weir. The California Department of Fish and Game and the Bureau of Reclamation are also in support of this proposed action. Following the receipt of this letter, it is hoped that the NMFS will announce a decision on the issue by mid-September 2002, thus allowing time to prepare for the implementation of a final action prior to the first week of October 2002.

As presented in the enclosed document, examination of available information suggests clear rationale does not exist to support not passing adult Coleman NFH steelhead above the barrier weir in Battle Creek. The Service and the other Resource agencies, do, however, recognize that outstanding genetic questions (e.g., domestication effects) remain in all cases where hatchery and natural-origin individuals commingle and interbreed in the natural environment. Although the passage of hatchery-origin steelhead above the Coleman NFH barrier weir in Battle Creek will likely result in the natural spawning of these adults in upper Battle Creek, available information (e.g., existing genetic information, estimates of spawning habitat carrying capacity in Battle Creek and estimates of current population levels of hatchery and natural-origin steelhead returning to Battle Creek), suggests that the potential risks associated with the action may be less substantial than the risks/outcomes assumed or inherent as a result of implementing the non-passage alternatives. Additionally, the potential genetic and demographic benefits associated with the action may outweigh the benefits associated with the two feasible non-passage alternatives.

Regardless of the final outcome of this year's decision, the Service will continue working with NMFS and the other resource agencies to address issues associated with restoration of fish populations in Battle Creek and the integration of operations at the Coleman NFH. The Service is also committed to the further development of monitoring programs and/or research activities designed to address outstanding biological questions/issues.

Thank you in advance for your consideration of the enclosed information and for the participation of your staff in this process. Please contact me at (530) 365-8622 if you or your staff have any questions on the enclosed document.

Sincerely,



Scott Hamelberg
Project Leader

Enclosure

cc:

Jim Smith, USFWS, Red Bluff
Kevin Niemela, USFWS, Red Bluff
John Scott, USFWS, Anderson
Mike Keeler, USFWS, Anderson
Dale Pierce, USFWS, Sacramento
Mary Ellen Mueller, USFWS, Sacramento
Don Campton, USFWS, Abernathy Tech Center, WA
Wayne White, USFWS, Sacramento
Ken Lentz, USBR, Sacramento
Susan Ramos, USBR, Sacramento
Dave Gore, USBR, Sacramento
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Mike Berry, CDFG, Redding
Randy Benthin, CDFG, Redding
Pat Overton, CDFG, Redding
Steve Turek, CDFG, Redding
Gary Stacey, CDFG, Redding
Mark Stopher, CDFG, Redding
Don Koch, CDFG, Redding
Shirley Witalis, NMFS, Sacramento
Mike Tucker, NMFS, Sacramento
Carlos Garza, NMFS, Tiburon *SANTA CRUZ*
Diane Windam, NMFS, Sacramento

**Management Strategy for the use of adult Coleman National Fish
Hatchery-origin steelhead surplus to broodstock needs.**

Representatives from the National Marine Fisheries Service (NMFS), California Department of Fish and Game (CDFG), Bureau of Reclamation (BOR), and U.S. Fish and Wildlife Service (Service) have met three times over the last four months to attempt to develop a joint strategy for managing hatchery-origin steelhead surplus to broodstock needs at the Coleman National Fish Hatchery (NFH). On May 15, the group focused on non-passage options for surplus hatchery-origin steelhead (i.e., options other than passage above the barrier weir into upper Battle Creek), while the second meeting (July 11) focused specifically on issues related to passing the adults above the weir. To further the discussion and to provide additional guidance on the steelhead recovery planning process, the July 11 meeting was attended by NMFS experts in recovery coordination and ESA policy issues and Service and NMFS experts on genetic issues. A third meeting was held on Aug 13 to attempt to achieve a consensus decision prior to the 4-Agency meeting on August 21, 2002.

Although much good effort has been devoted to identify the best use of surplus Coleman NFH-origin steelhead, a consensus decision regarding the disposition of adult steelhead surplus to Coleman NFH broodstock needs has not been reached. As the collection of steelhead adults begins with the onset of the broodstock collection and spawning operations for fall chinook salmon at Coleman NFH, a final decision remains necessary prior to the first week of October 2002.

Through this document, a strong case is made to support the proposal to pass adult surplus hatchery-origin steelhead above the Coleman NFH barrier weir. This justification is submitted to the National Marine Fisheries Service due to the Agency's regulatory responsibility associated with their jurisdiction over this species (natural-origin Central Valley steelhead are listed as threatened under the Endangered Species Act). The species is not listed under the California Endangered Species Act. Following the submission of this document, it is expected that the National Marine Fisheries Service will announce a determination on the issue by mid-September 2002, thus allowing time to prepare for the implementation of a final action prior to the first week of October 2002.

Proposed Action: *Pass all adult hatchery-origin steelhead surplus to Coleman NFH spawning needs above the barrier weir. In conjunction with this action, tissue samples for future genetic analyses and other biological data (e.g., length, gender) will be collected from at least a sub-sample of the steelhead (hatchery and natural-origin) passed above the barrier weir.*

Available genetic information

Available information (Busby et al. 1996) suggests Coleman NFH steelhead are genetically similar to remaining natural stocks in Mill and Deer creeks. The analysis of population structure

performed by NMFS was based on data for 51 polymorphic allozyme gene loci. Population structure detail was obtained through generation and examination of different ways of summarizing patterns of genetic relationships based on Nei's unbiased genetic distance values (Nei 1978, cited through Busby et al. 1996), between each pair of the populations (Busby et al. 1996). Attachment 1 presents a dendrogram (one dimension) constructed using the unweighted pair-group method analysis (UPGMA) with arithmetic averaging populations (Busby et al. 1996). Attachment 2 presents a different representation of the same data using multidimensional scaling (MDS) which allows viewing the pattern of relationship among populations in two or three dimensions populations (Busby et al. 1996). The analysis and data presentation demonstrate that the sample from Coleman NFH and the samples from Mill and Deer creeks (i.e., the two natural populations in the Sacramento River Basin believed to contain the most likely remnants of native steelhead) form a small coherent group that is quite distinct from all other California steelhead populations. Based on their analyses of steelhead population structure, NMFS concluded that the genetic similarity of Coleman NFH steelhead with those of Mill and Deer creeks could have resulted from: 1) introgression of the Coleman NFH steelhead genetic characteristics into the natural populations; or, 2) a close ancestral relationship resulting from the use of predominantly local (i.e., upper Sacramento River) broodstock.

Conclusion: NMFS's genetic analyses demonstrate that Coleman NFH steelhead and two natural populations in the Central Valley constitute a genetically distinct group of populations with high genetic similarity compared to other California and West Coast steelhead populations.

Coleman NFH Steelhead Broodstock History

Historically, most steelhead adults collected for Coleman NFH broodstock have come from Battle Creek or the upper Sacramento River. Propagation of steelhead at the Coleman NFH was initiated in 1947 with the collection of natural-origin steelhead adults at the Keswick Dam fish trap. In 1953, hatchery-origin adults began to return to Battle Creek and steelhead broodstock were collected from Battle Creek for the first time. From 1954 through 1977 steelhead broodstock were collected at both Battle Creek and the fish trap at Keswick Dam. In 1978 steelhead broodstock were collected at the Red Bluff Diversion Dam. From 1979 through 1983 all steelhead broodstock were collected from Battle Creek. Steelhead broodstock were collected from the Keswick Dam fish trap most recently in 1984, and subsequent to that year, all steelhead broodstock have been collected from Battle Creek.

Throughout the history of the steelhead program at the Coleman NFH, both natural and hatchery adults have been used as broodstock at Coleman NFH. Steelhead collected at the Keswick Dam fish trap are considered to be natural-origin whereas steelhead collected from Battle Creek are considered to be a mix of natural- and hatchery-origin adults.

Conclusion: Natural-origin steelhead from the upper Sacramento River are the founding stock for Coleman NFH steelhead broodstock, and natural-origin steelhead and hatchery-origin steelhead have been integrated at the Coleman NFH for over 50 years.

Inclusion of Coleman NFH steelhead in the Central Valley ESU

Busby et al. (1996) determined that steelhead at Coleman NFH are included within the California Central Valley Evolutionarily Significant Unit (ESU). This determination was made based on the following information: 1) steelhead from Coleman NFH and natural-origin steelhead from Mill and Deer creeks form a distinct genetic clustering when compared to other steelhead populations from the West Coast; and 2) the steelhead propagation program was founded with native Central Valley steelhead and natural steelhead have been incorporated as hatchery broodstock on a regular basis. Although Coleman NFH steelhead are considered part of the ESU, they are not currently listed.

Conclusion: Genetic data and broodstock history led NMFS to conclude that Coleman NFH steelhead are part of the Central Valley ESU.

Reexamination of ESUs

Based on the status review of West Coast steelhead, NMFS determined that steelhead from Coleman NFH are included within the California Central Valley ESU. However, as a result of the Hogan Decision (Alsea case), the NMFS is currently reexamining the status of ESUs that contain a hatchery component. Within this review process, decisions to exclude the hatchery component from established ESUs will likely require newly acquired information which is substantive enough to reverse the previous decision to include the hatchery stock within the ESU. Although the outcome of the review of the Central Valley steelhead ESU is unknown, given the strength of the previous analysis and lack of any newly acquired information suggesting that Coleman NFH steelhead should not be included within the Central Valley ESU, the probability of reversing the previous decision to include Coleman NFH steelhead in the ESU appears low.

Conclusion: Although the outcome of the review of the Central Valley steelhead ESU is unknown, given the strength of the previous analysis and lack of any newly acquired information, the probability of reversing the previous decision to include Coleman NFH steelhead in the ESU appears low.

Genetic similarity of Coleman NFH steelhead with natural origin steelhead within the Battle Creek watershed.

No previous genetic analysis on natural-origin steelhead in Battle Creek has been conducted. Therefore the genetic similarity/difference between Coleman NFH steelhead and natural-origin steelhead in the Battle creek watershed is unknown. However, due to the long history (50 plus years) of steelhead propagation in the Battle Creek watershed, we would expect the genetic similarity between natural and hatchery-origin steelhead in Battle Creek to be at least as high as the genetic similarity between Coleman NFH steelhead and natural steelhead in Mill and Deer creeks.

In addition to incorporation of natural-origin adults as hatchery broodstock (see previous section on broodstock history), there is a high likelihood that hatchery-origin adults have spawned naturally in Battle Creek. Although the parentage of natural-origin steelhead in the Battle Creek watershed is unknown, there is a high likelihood that some percentage of these fish are the progeny of naturally-spawning hatchery-origin adults. Coleman NFH spawning records indicate steelhead adults have intentionally been passed above the Coleman NFH barrier weir during many years throughout the program's history. For example, spawning records from 1953 through 1995 indicate frequent releases of adults (range: <100 to approx. 1,500 per year) above the Coleman barrier weir. In more recent years, (i.e., since 1996), large numbers of hatchery- and (presumably) smaller numbers of natural-origin adult steelhead have also been passed above the Coleman NFH barrier weir into upper Battle Creek (Table 1). An unknown number of steelhead adults may also escape past the Coleman NFH barrier weir each year (i.e., ascend the barrier weir directly without using the fish ladder). Of the hatchery and/or natural-origin adults that are passed above the weir (or escape above the weir), it is expected that a significant proportion spawn naturally in upper Battle Creek and contribute (natural-origin adults) to the next generation. Hatchery- and naturally- produced steelhead adults have largely been distinguishable in Battle Creek since 2001 because of a recently implemented (1997) steelhead mass marking program (i.e., adipose fin clipping) at Coleman NFH. During return year 2001/2002 approximately 87% of the steelhead adults passed upstream of the barrier weir were of hatchery-origin (Table 1). As a conservative estimate, if this percentage (80% +) is applied to the total number of steelhead passed above the barrier weir in previous years, then there is a high likelihood that a percentage of natural-origin adults currently present in Battle Creek are the progeny of hatchery-origin steelhead that naturally spawned and reproduced successfully.

Table 1. Number of steelhead from Coleman National Fish Hatchery released above the barrier weir in Battle Creek, return years 1995/1996 - 2001/2002.

Return Year	Number of Steelhead Passed
1995/1996	276
1996/1997	295
1997/1998	418
1998/1999	1,163
1999/2000	1,416
2000/2001	1,483
2001/2002	1,866 (87% hatchery-origin)

Conclusion: Although direct genetic analyses have not been conducted, natural- and hatchery-origin steelhead in the Battle Creek watershed are likely very similar genetically (due to common ancestry and over 50 years of continual mixing/integration).

Current Habitat Carrying-Capacity upstream of the Coleman NFH barrier weir

Some concern surrounding the question of whether or not to pass surplus hatchery-origin adult steelhead has revolved around issues of habitat carrying-capacity in upper Battle Creek. An analysis of spawning habitat carrying-capacity recently completed by CDFG suggests the existing habitat should be able to support approximately 3,700 spawning steelhead (analysis on file). The number of fish to be passed is expected to be well below this estimate of habitat carrying-capacity.

Conclusion: Passage of hatchery-origin steelhead above the barrier weir in Battle Creek will not exceed the estimated spawning habitat carrying-capacity.

Genetic/Demographic Effects

The genetic and demographic risks of passing Coleman NFH steelhead above the barrier weir are both considered low at this time because of (a) the ancestry of the hatchery broodstock (consistent with a high genetic similarity to the Deer and Mill creek natural populations) and (b) the current low abundance of natural-origin spawners in Battle Creek, respectively. On the other hand, excluding Coleman NFH steelhead from the upper Battle Creek watershed would preclude potential genetic and demographic benefits to the natural population. For example, NMFS geneticist Dr. Carlos Garza noted (July 11, 2002) that excluding returning, Coleman NFH adults from the upper Battle Creek watershed may, in fact, incur greater risk than allowing them upstream to spawn naturally. This latter conclusion was based on his consideration of Coleman NFH broodstock history and the low abundance of returning natural-origin adults relative to the available spawning habitat (carrying capacity) in Battle Creek.

Relative benefits and risks of alternative actions

Aside from the option of passing the surplus adults above the barrier weir, the co-managing agencies developed and evaluated 11 potential "non-passage" alternatives. After additional consideration of the 11 non-passage alternatives, two have been identified as potentially feasible alternatives: (a) release of surplus adults back into Battle Creek below the weir, and (b) outplanting to a closed system (e.g., freshwater lake or reservoir) to support a sport fishery. Although the benefits and risks of these two alternatives have been discussed during previous meetings a more complete discussion is offered below. After further examination of the remaining non-passage alternatives, and based on available information we conclude passing surplus adults above the weir still affords greater benefit and less risk than the other two alternatives.

The first of the remaining two feasible alternatives is to return all hatchery-origin steelhead surplus to Coleman NFH broodstock needs back to Battle Creek "below" the barrier weir. This alternative will leave the adults in the Battle Creek system, but will afford some level of spatial separation between hatchery-origin adults and natural-origin adults. All natural-origin adults encountered during broodstock collection will be passed upstream of the barrier regardless of the disposition of hatchery-origin adults. However, even if surplus hatchery-origin steelhead are released below the barrier weir in Battle Creek, commingling of hatchery- and natural-origin adults is still likely occur in Battle Creek. For example, not all natural-origin adults will choose to pass the barrier weir (i.e., may volitionally spawn with/among hatchery-origin adults in Battle Creek below the barrier weir). Conversely, unknown numbers of hatchery-origin adults may consequently volitionally ascend the weir and access habitats upstream of the barrier weir and spawn with/among natural-origin adults. This scenario, therefore, has the potential to confound population/habitat suitability monitoring, as precision on estimating the numbers of available spawners and hatchery/natural ratios above and below the weir in Battle Creek is further compromised. "Recycling" hatchery-origin steelhead below the weir would also potentially increase density and competition effects on natural steelhead attempting to approach/pass the weir. Additionally, the higher quality spawning and rearing habitats available above the weir will likely remain underutilized.

The second option consisted of removal of all hatchery-origin steelhead from the Battle Creek watershed with subsequent placement in an appropriate off-site nonanadromous location. This alternative is expected to provide only minimal recreational benefit because the areas that have been proposed are already heavily stocked with rainbow trout by the California Department of Fish and Game. Furthermore, this alternative could involve potential genetic and demographic risks associated with the reproductive loss resulting from the direct removal of significant numbers of natural spawners and the potential loss of the corresponding genotypes.

Summary

Examination of available information suggests clear rationale does not exist to support not passing adult Coleman NFH steelhead above the barrier weir in Battle Creek. Consequently, for the four reasons outlined below, the proposed action to pass surplus adult hatchery-origin steelhead above the barrier weir in Battle Creek currently appears to be the best alternative for those fish in terms of maximizing potential benefits with minimal risks. Tissue samples for future genetic analyses and other biological data (e.g., length, gender) will be collected from at least a sub-sample of the steelhead (hatchery and natural-origin) passed above the barrier weir.

1) Existing genetic data, the ancestral history of the hatchery broodstock, and recent estimates of the abundance of natural-origin adults returning to Battle Creek indicate that the genetic and demographic risks of passing adult Coleman NFH steelhead above the weir are minimal at this time. Conversely, based on the same information, passing hatchery-origin adults upstream of the weir can potentially confer significant genetic and demographic benefits to the naturally

spawning population in upper Battle Creek, thus potentially assisting with restoration of steelhead in the Battle Creek watershed.

2) Genetic analysis and consideration of broodstock history led NMFS to conclude that Coleman NFH steelhead are part of the Central Valley ESU. Data that would reverse this conclusion appear to be lacking.

3) The estimated carrying-capacity of spawning habitats in Battle Creek upstream of the barrier weir suggests the habitat can support substantially more adults than are expected to be encountered and passed upstream.

4) Through a multi-agency process, alternatives other than passage above the barrier weir have also been developed and analyzed as part of the series of meetings to resolve this issue. Eleven non-passage alternatives were previously developed and analyzed. Evaluation of these alternatives have narrowed down the number of feasible alternatives from eleven to two. However, those two alternatives carry minimal benefit, create additional risks and significantly reduce, or eliminate, the potential benefits associated with passing Coleman NFH steelhead above the barrier weir.

Agency Positions:

The U.S. Fish and Wildlife Service, the California Department of Fish and Game (letter on file), and the U.S. Bureau of Reclamation, support the proposed action of passing surplus hatchery-origin adult steelhead above the Coleman NFH barrier weir in Battle Creek.

References:

Busby P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz and I.V. Lagomarsino. 1996. Status review of West Coast steelhead from Washington, Idaho, Oregon and California. National Marine Fisheries Service. NOAA Technical Memorandum NMFS-NWFSC-27.

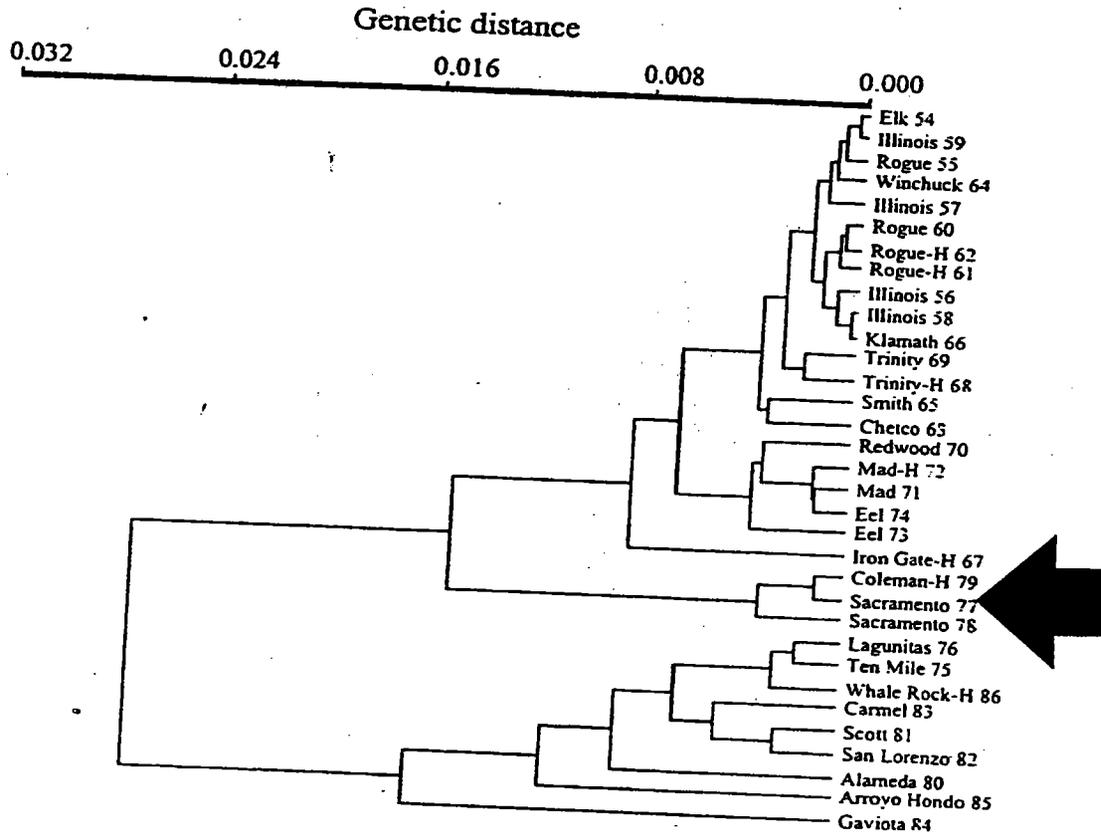


Figure 3. Dendrogram based on unweighted pair-group method analysis (UPGMA) clustering of pairwise genetic distance values (Nei 1978) among 33 hatchery (-H) and natural steelhead populations from southern Oregon to southern California. Analysis was based on data for 51 polymorphic gene loci scored in samples analyzed by NMFS. Sample names and numeric codes correspond to those in Appendix A.

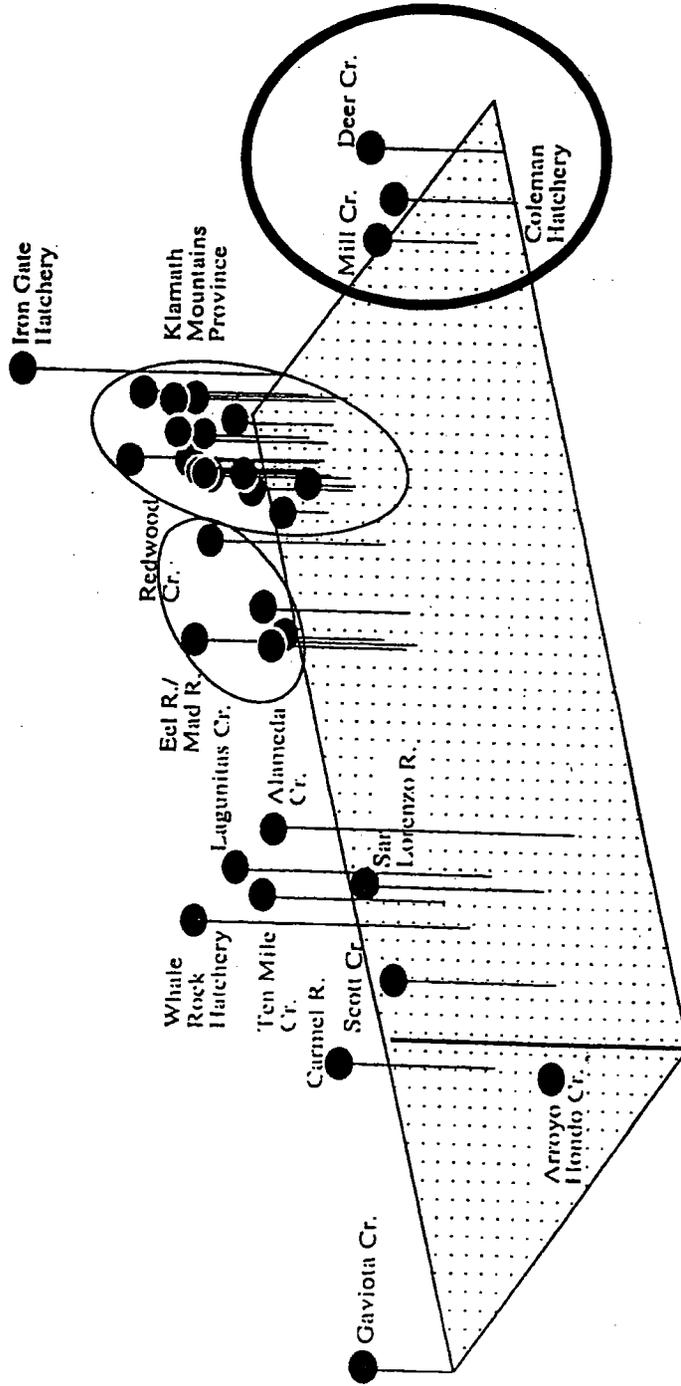


Figure 4. Multidimensional scaling plot (MDS) of genetic distance values used in Figure 3.

Documentation Associated with the Greater Battle Creek Working Group

Draft Greater Battle Creek Watershed Adaptive Management Framework and Organization

Battle Creek Watershed Community Strategy, June 2000

The Battle Creek Watershed Conservancy Position on the Battle Creek Salmon and Steelhead Restoration Program and Related Activities, July 24, 2000

Battle Creek Watershed Conservancy Task List (DRAFT), August 31, 2000

Managing Risk to Facilitate the Success of the Battle Creek Salmon and Steelhead Restoration Project, January 29, 2001

Battle Creek Watershed Conservancy Position on the Restoration Project, June 11, 2001

Four-Agency Letter, September 20, 2001

Draft Greater Battle Creek Working Group Memorandum of Understanding, August 8, 2002

Correspondence from Battle Creek Watershed Conservancy to CALFED, October 25, 2002

**Draft Greater Battle Creek Watershed
Adaptive Management
Framework and Organization**

Draft Greater Battle Creek Watershed Adaptive Management Framework and Organization--

Developed by the Stakeholders of BCWG

Serge Birk, Sharon Paquin Gilmore, Zeke Grader, Larry Lucas, Peggy McNutt

The following summary and proposed adaptive management framework and organization has been prepared by NGO stakeholders as comments for consideration for inclusion in the:

- PG&E Battle Creek Hydroelectric Project FERC No. 1121 Project License Amendment process.
- Battle Creek Salmon and Steelhead Restoration Project Adaptive Management Plan.
- Programmatic EIS/EIR PG&E MOU Restoration Project.
- Coleman National Fish Hatchery (CNFH) evaluation project HARZA
- CNFH "Steelhead Supplementation Program"
- CVPIA (B)(3) Water Acquisition Program

Executive Summary

It is the opinion of the stakeholders that unless a landscape scale watershed adaptive management framework and organization is developed and integrated into all components currently in place or proposed for the greater Battle Creek watershed, the ability to learn from success and failures and to meet goals and objectives of funded programs is compromised. Without this type strategy which links actions to one another, it is unlikely that the goals of CNFH, CVPIA, CALFED, ESA and FERC are to be met. Simply stated we do not endorse an incremental restoration strategy but rather suggest a process which evaluates and directs restoration actions which are compatible and synergistic.

Historical Context

Since the establishment of the Battle Creek Working Group (BCWG) in 1997, the NGO stakeholders of BCWG have been instrumental in promoting restoration opportunities in the Battle Creek watershed. As part of this process, the NGO stakeholders have advocated a collaborative approach and encouraged the development of a landscape scale watershed approach to identify and solve problems in the watershed that may have contributed to the decline in anadromous fish population and ecosystem health. Central to this approach is having open dialogue with all interested parties, stakeholders and agencies engaged with planning, funding and implementation of restoration actions and projects in the Battle Creek watershed. For the purposes of this document, the greater Battle Creek watershed refers to the entire Battle Creek watershed from its confluence to the headwaters and major tributaries as well as the upper Sacramento River to the extent that the Livingston Stone Fish Hatchery is connected to the Battle Creek hatchery program.

Funding Linkages:

Restoration in the Battle Creek Watershed has been underwritten in part by CALFED Category III, CVPIA B3 funds for water acquisition, CVPIA funds for rehabilitation of CNFH and CALFED ERP direct funding of other actions (PG&E MOU) and numerous other public and private funders.

Funding has been provided to numerous state and federal agencies to prepare and conduct planning and environmental documentation required for promulgation of the Record of Decision (ROD) for the Restoration Project (PG&E), development of watershed plan (USFWS /Kier Report), interim water acquisition program (USBR) as well as funding to NGO partners e.g. CALFED /AFRP Battle Creek Watershed Conservancy Upper Watershed Plan and CVPIA/WCB/private funding for conservation easement acquisition and restoration projects initiated by TNC.

Because of these apparent funding and programmatic linkages, it is incumbent of all recipients, government agencies and NGO stakeholders to demonstrate how implementation of proposed actions and projects meet the goals and objectives of program funding actions in the greater Battle Creek watershed under the auspices of CALFED ERP and CVPIA AFRP goals and FERC amendment commitments.

Fundamental Principle

Science-based adaptive management is a decision process and a tool which involves the development of conceptual models, testable hypotheses and evaluation of experiments. A critical component of adaptive management is experimentation and assessment of resource management alternatives and actions. These experiments are designed to clarify and remove scientific uncertainties and risk associated with current and future management actions and alternatives and can lead to more efficacious restoration opportunities. For example, by confirming with experiments and guided by testable hypotheses, that recommended management actions and alternatives fail to meet explicit goals and objectives, managers will be able to alter future actions and alternatives appropriately to make prudent management decisions.

Stakeholder Issues

A landscape scale watershed adaptive management organization and framework must be established to provide the needed forum and process to facilitate effective planning, implementation and progress in the greater Battle Creek watershed.

Hypothesis based actions must disclose explicit indicators, measures of success and cause and effects relationships associated with restoration actions and respective conceptual models must be developed. Furthermore, linkages of proposed programs must be apparent, disclosed and evaluated in total not as separate, incremental solutions as currently proposed within the context of CNFH reevaluation and Restoration Project (PG&E MOU), for example.

Unfortunately, NGO stakeholder participation in this type of meaningful dialogue has not been institutionalized in either of the restoration programs mentioned above. Of equal concern, proposed approaches being disclosed in draft documents for both the CNFH and PG&E projects suggest that, at best, NGO stakeholder input is likely to be marginalized in the future.

In addition, PG&E, a major stakeholder of the Restoration Program, has suggested to FERC that the proposed AMP has been reviewed and received acceptance by all stakeholders to date. Unfortunately, verbal comments articulated by stakeholders at workshops have not always been accurately recorded, detailed or made part of the institutional record. We feel it is important that NGO stakeholder comments are recorded in sufficient detail to accurately reflect our positions.

We also support the comments made by Dr. Healy regarding the Adaptive Management Plan and hope to understand how his comments are incorporated into the proposed AMP.

INSTITUTIONAL CONSTRAINTS AND ISSUES

Restoration Project PG&E MOU

An adaptive management organizational structure is proposed under the existing MOU and current Adaptive Management Plan (AMP) component of the MOU. However, the structure does not include meaningful participation of many stakeholders in the watershed and specifically participant NGO stakeholders of the Battle Creek Working Group. Also, under the proposed AMP the role of independent peer review is not identified or addressed. Furthermore, linkages to CVPIA and CALFED goals are not apparent for the greater Battle Creek watershed.

CNFH Reevaluation

A reevaluation of CNFH operations is currently in progress by Harza, contractor to USFWS. NGO stakeholders have consistently stated that the reevaluation is too narrow in scope and tends to focus on current operations instead of operation of CNFH under restored conditions. Stakeholders have pointed out that it is unlikely that the current reevaluation adequately addresses linkages and potential impacts to overall CALFED, CVPIA and ESA restoration and recovery goals as well as other watershed projects. Stakeholders have also recommended that in order to meet the objectives of the intended unbiased assessment of alternatives and reevaluation of operations of CNFH, an independent peer review be instituted in a timely fashion and prior to finalization.

It is our understanding that since 1995, operators of CNFH have included supplementation (passage of hatchery steelhead above CNFH) as a restoration tool for Battle Creek watershed. This supplementation strategy appears inconsistent with the CALFED and CVPIA Record of Decision (ROD) for implementation of PL 102-575 CVPIA specifically AFRP, and the CALFED Ecosystem Restoration Program.

This supplementation action also warrants management and policy review to determine if "supplementation of federally listed species" is an acceptable restoration tool and policy. Furthermore, technical and policy review is warranted to determine if supplementation is consistent with CVPIA and CALFED restoration goals and objectives.

It is important to note that a current Biological Opinion from NMFS has not been promulgated on the topic of supplementation as an acceptable tool for restoration of federally listed steelhead in the Battle Creek Watershed and at CNFH. It is incumbent that NMFS prepare a BO which addresses the supplementation issue.

The BO should also provide a credible risk assessment in order to allow policy makers to determine if current CNFH supplementation actions are compatible with CVPIA AFRP goals to at least double "natural populations" and CALFED ERP goals and objectives to restore habitat to restore naturally produced salmonids in Battle Creek.

USBR Interim Flow Agreement

USBR and USFWS have secured funding for an interim flow agreement for the past three years. It is unclear what monitoring and assessment protocols or indicators and measures of success were used during this period to evaluate the efficacy of the interim flow agreement.

Furthermore, without development of peer review and disclosure of monitoring, research and assessment tools proposed to be used in the future, it is unlikely that a true active adaptive management program can be implemented in the greater Battle Creek watershed.

The NGO stakeholders also need a better understanding of the "no conservation value" declaration.

CONCLUSION

Restoration of the greater Battle Creek watershed is a comprehensive effort involving numerous funding sources with multiple goals and objectives, numerous potential government and non-government partners and stakeholders. Success can only be achieved with active participation of all stakeholders in the overall process and in all relevant forums affecting watershed or landscape management.

As a result of both the lack of adequate avenues for stakeholder input and lack of linkages between major programmatic actions within the greater Battle Creek watershed, the NGO stakeholders recommend the following:

1. An inclusive adaptive management framework for the greater Battle Creek watershed must be established.
2. Stakeholder involvement should be inclusive and formalized.

Planning and implementation of all fisheries and restoration actions in the watershed and appropriate adaptive management processes should be discussed and approved through the auspices of a formal advisory group similar to, if not the Battle Creek Working Group (BCWG). This type of broad, inclusive forum can contribute to advancing progress for ESA recovery, CVPIA doubling goals of naturally produced salmonids pursuant to AFRP and CALFED ecosystem restoration goals to restore habitat, ecosystem functions and processes. Furthermore, this adaptive management framework and organization would be valuable to landowners and stakeholders throughout the watershed and other parties associated with planning concerned with other relevant issues in the watershed including CNFH operations, PGE, CDFG, TNC, BCWC, etc.

We ask that these comments be incorporated into the draft EIS and be considered comments for other documents as well.

As we continue to move forward with the myriad of greater Battle Creek watershed projects, we also look forward to establishing a process within the Battle Creek Working Group to discuss and further develop these ideas.

Proposed Battle Creek Organization and Framework For Adaptive Management Greater Battle Creek Watershed

Battle Creek Goals and Objectives

Are derived from an agreed upon

Comprehensive watershed plan (Similar to Kier approach) which

Incorporates CVPIA, CALFED, ESA, CNFH, FERC and CONSERVANCY

Goals and Objectives

- 1. ESA goals: population recovery and habitat protection**
- 2. CVPIA: goals 2x natural populations, habitat restoration**
- 3. CALFED goals: restore ecosystem functions processes, habitat and MSCS protective measures**
- 4. FERC goals : Project License Amendment Process**
- 5. Conservancy goals: Program compatibility with Greater Battle Creek Watershed**

Program success, failures measured by:

- ESA based populations factors, habitat indicators, fish screen criteria, genetic robustness**
- CVPIA performance guidelines based on performance pursuant to and population responses (cohort recruitment, survival rates and habitat restoration (quality and quantity)**
- CALFED goals and objectives based on ecosystem processes and functions responses and scientific experiments which address uncertainty.**
- FERC goals may be measured with the selection of the preferred alternative pursuant to the PG&E MOU**
- CONSERVANCY goals include reduced risk to landowners of Upper Battle Creek and recognition as partner in the restoration process.**

**Current Battle Creek Organization and Framework
Battle Creek Goals and Objectives**

(No agreed on overall watershed strategy or comprehensive plan for greater watershed)
Lack of landscape indicators or measures of success

CVPIA and CALFED Goals and Objectives

ESA goals: population recovery and habitat protection
CVPIA: goals 2x natural populations, habitat restoration
CALFED goals: restore ecosystem functions processes, habitat and MSCS protective measures

Funding Sources: (CVPIA Restoration Funds, CALFED ERP and Private Sources)
Funding Oversight: CVPIA Restoration Roundtable, CALFED Ecosystem Roundtable Successor and Other Private Sources

Restoration Programs

CVPIA	CNFH	ESA	CALFED
AFRP 2x plan AFSP B3 Water Acquisition CAMP	CVP Mitigation Supplementation CVPIA B11 IEP CWT Program	Population Recovery Critical Habitat CNFH BO Genetics	Ecosystem Attributes MSCS Habitat/Land Acquisition Watershed Partnering Science Program

Current and Proposed Restoration Actions

TNC Land acquisition Habitat Restoration	CNFH Harza Evaluation Supplementation Intake Screening Barrier Weir LSFH	PG&E MOU Restoration Project Interim Water Acquisition FERC Project License Amendment Process Adaptive Management	CONSERVANCY Education Partnerships Facilitation Public Affairs Watershed Assessment
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Missing Links

No apparent linkage or role for BCWG or NGO's
Lack Overall Program Synergy
Lack of Adaptive Management Strategy
Lack of Program Connectivity
Lack of Peer Review
Lack of Indicator Development
Lack of Comprehensive Monitoring
Lack of Stakeholder Buy in or Consensus

**Greater Battle Creek Watershed Programmatic
Linkages and Proposed Organization**

**Greater Battle Creek Watershed Plan
Goals and Objectives**

Funding Sources

**USBR/USFWS
CVPIA Restoration
Roundtable**

**CALFED Management Group
CALFED Ecosystem Roundtable
Successor Group**

Private Partners

Restoration Programs

CVPIA

AFRP 2x plan
AFSP
B3 Water Acquisition
CAMP

CNFH

CVP Mitigation
Supplementation
CVPIA B11
IEP CWT Program
LSFH

ESA

Population Recovery
Critical Habitat
CNFH BO
Genetics

CALFED

Ecosystem Attributes
MSCS
Habitat/Land Acquisition
Watershed Partnering
Science Program

**Greater Battle Creek Working Group
(Formalized Working Group including stakeholders)**

This group shall provide a forum to:

- Consensus for partnering and collaboration.**
- Discuss and identify linkages of current and proposed restoration actions.**
- Review technical merit of proposed actions**
- Review conceptual models, hypotheses and adaptive management experiments.**
- Review indicators and measures of success to evaluate program performance.**
- Serve as facilitator.**
- Recommend projects for funding.**

Current and Proposed Restoration Actions

TNC
Land acquisition
Habitat
Restoration

CNFH
Harza Evaluation
Supplementation
Intake Screening
Barrier Weir
LSFH

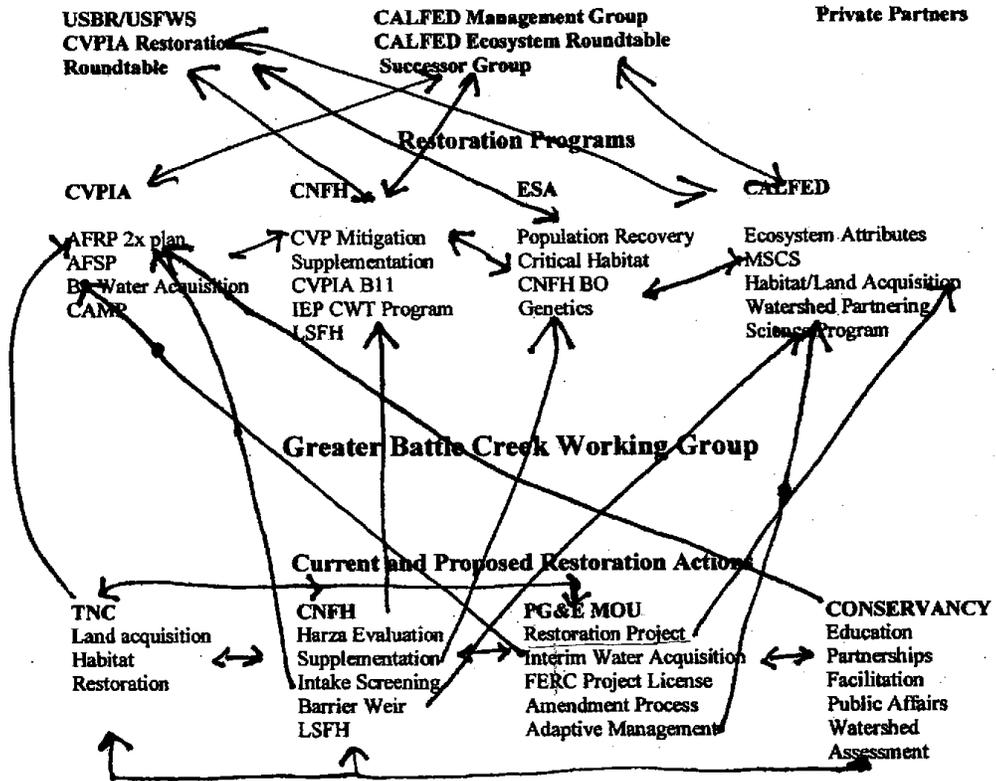
PG&E MOU
Restoration Project
Interim Water Acquisition
FERC Project License
Amendment Process
Adaptive Management

CONSERVANCY
Education
Partnerships
Facilitation
Public Affairs
Watershed
Assessment

Proposed Greater Battle Creek Watershed Organization and Framework

GBW Watershed Plan Goals and Objectives

Funding Sources



**Battle Creek Watershed Community Strategy,
June 2000**

INTRODUCTION

Battle Creek, among other habitats in the Central Valley, was once home to a large population of salmon and steelhead. Little now remains of the historic habitat for these fish; present Battle Creek is degraded, primarily due to a lack of instream flow caused by hydroelectric generation (USFWS 1995). Now, Californians are seeking every opportunity to restore Central Valley salmon and steelhead runs.

Battle Creek is considered to be the watershed with the highest potential for restoring salmon and steelhead in the Sacramento River Watershed for a number of reasons, including: historic and current land uses, private stewardship of much of the land, and the minimal development of most of the watershed. The rural landscape, which is highly valued by the residents of the watershed, includes ranches owned by generations of the same family, timberlands, and higher alpine areas, which are economically and historically valuable.

In 1997, a stakeholder-based Battle Creek Working Group (BCWG) was formed to accelerate salmon and steelhead restoration in the watershed based on the AFRP. The BCWG includes stakeholder representatives from the State and federal resource agencies, and fishery, environmental, local, agricultural, power, and urban stakeholders communities. Also in 1997, the Battle Creek Watershed Conservancy (BCWC) was formed to provide representation for landowners, stakeholders, and residents of the watershed. Its purpose was to look beyond efforts to simply “fix” the creek, but to consider the long-term health of the entire watershed.

An opportunity exists for the landowners and residents of the Battle Creek watershed to retain their rural landscape and lifestyle while at the same time working to restore Battle Creek and its surroundings to a healthy environment for both fish and other wildlife. Preserving the rural lifestyle, agricultural heritage, and existing land uses of the Battle Creek watershed is recognized as essential for the resurgence of the anadromous fish populations. It is becoming widely recognized and accepted that maintaining farmland saves wildlife, including anadromous fish. The intent of this document is to provide watershed residents with the framework for continued responsible stewardship through effective management practices.

STRATEGY SUMMARY

The Battle Creek Watershed Community Strategy is the framework for future watershed restoration and education activities in the Battle Creek Watershed. It was developed in response to the Anadromous Fish Restoration Program (AFRP) led by the U.S. Fish & Wildlife Service, which saw an opportunity to increase natural production of anadromous fish by augmenting and assisting restoration efforts presently conducted by local watershed workgroups. The program emphasizes strategies and actions to support the restoration of large runs of chinook salmon to Battle Creek and the continuation of a healthy, fully functioning watershed. Recognizing the stewardship responsibilities all landowners assume within the watershed, the strategies emphasize on-the-ground actions and best management practices to ensure the future continued health of the watershed.

The most significant part of this document consists of thirteen strategies and related recommendations to achieve the goal of the Battle Creek Watershed Conservancy: "To preserve the environmental and economic resources of the Battle Creek watershed through responsible stewardship, liaison, cooperation, and education."

The strategy was developed with information gathered during numerous community meetings held throughout the watershed during the past two years (1997-1999). Many of the meetings were sponsored by the Battle Creek Watershed Conservancy, or were jointly sponsored by both the Conservancy and the Battle Creek Watershed Project. The Conservancy also sponsored a series of six meetings from March-April 1999 to provide residents of the watershed communities with the opportunity to review the strategy document draft and to make comments and recommendations. The resulting document reflects the input received from stakeholders at the community meetings.

This community strategy is a living and adaptive management document and planning guide that will reflect new resource management issues, and also guide implementation priorities. It provides us with the framework for continued responsible stewardship through effective management practices.

We look forward to working with our many stakeholders to provide the improvements necessary to protect and enhance our watershed, one of the most unique in California.

Detailed Battle Creek Watershed Community Strategy

- I. **Strategy: Work to restore and maintain suitable habitat conditions for Chinook salmon, steelhead and other aquatic resources of the Battle Creek watershed.**

Action items:

- A. Continue to help resolve stream flow and fish passage issues in Battle Creek through active participation in the Battle Creek Working Group (BCWG).
- B. Encourage and support restoration programs determined by the BCWG and supported by the BCWC as best for the fish and in cooperation with property owners.
- C. Encourage on-going monitoring of restoration areas (reaches) to evaluate in-stream flow conditions.
- D. Encourage on-going monitoring of restoration areas (reaches) to evaluate and ensure proper operating efficiency of fish ladders and screens at water diversions and appropriate/necessary controls at diversion outflows.
- E. Seek funding for watershed-wide assessment of existing conditions to identify impacts on anadromous fish restoration efforts.
- F. Plan strategies to address assessment findings which impact the health of the watershed and restoration activities.
- G. Seek funding for implementation of actions based on assessment recommendations.
- H. Facilitate educational opportunities for landowners to address their own stewardship needs.
- I. Encourage public agencies to resolve impacts identified on public lands.
- K. Request funding to continue the Battle Creek Working Group, to foster agency/stakeholder coordination and additional restoration work in the Battle Creek watershed.

II. Strategy: Seek to identify and protect critical holding, spawning and rearing habitats and anadromous fish resources.

Action items:

- A. Encourage California Department of Fish and Game maintain sufficient staff for the protection of the anadromous fishery resources, and encourage staff activities and on-the-ground monitoring.
- B. Work to ensure that all monitoring activities respect landowner's rights.
- C. Consider forming a Stream Watch program on Battle Creek, similar to a Neighborhood Watch, to monitor activities on the creek in coordination with CDF&G, the regulatory authority.
- D. Provide educational forums to help individuals understand the significance of critical habitats and life cycle needs of anadromous fish.
- E. Work to ensure that human disturbances do not create negative impacts on the fishery restoration efforts.
- F. Encourage support of federal monitoring efforts. Examples of such efforts are: In 1999 and 2000 the Fish and Wildlife Service (FWS) operated two rotary screw traps to estimate production of juvenile salmon and steelhead in Battle Creek. For about the past five years, California department of Fish and Game has conducted the carcass/redd surveys in the lower six miles of Battle Creek.

III. Strategy: Improve and maintain water quality throughout the Battle Creek watershed.

Action items:

- A. Encourage private and public landowners/operators to develop ranch and farm plans to ensure Best Management Practices on all watershed lands. Best Management Practices (BMPs) are a combination of management, cultural, and structural practices that agricultural scientists, the government, or some other planning agency decide to be the most effective and economical way of controlling problems without disturbing the quality of the environment.
- B. Encourage private and public landowners/operators to support forest management practices to maintain optimum water quality.
- C. Facilitate educational opportunities for landowners /operators in support of the their stewardship actions.
- D. Support development of appropriate monitoring protocols to assess water quality of the watershed.
- E. Facilitate educational opportunities for landowners to receive information on available financial support programs which address their own responsible stewardship needs.

IV. Strategy: Seek to delineate, improve and maintain riparian corridors along Battle Creek and its tributaries.

Action items:

- A. Work to ensure continued connectivity of riparian corridors throughout the watershed.
- B. Coordinate the assessment of and the eradication of non-native (noxious) plant species in riparian areas.
- C. Seek funding for actions to ensure healthy riparian corridors into the future.
- D. Encourage documentation of current resource management protections already provided throughout the systems' riparian corridors, demonstrating no need for either National Wild and Scenic designation, or for designation under the State of California Wild and Scenic program.

V. Strategy: Support Best Management Practices (BMPs) in the continuation of existing upland land uses, such as livestock grazing, farming, wildlife habitats, open space, and other uses in support of local sustainable economies.

Action items:

- A. Encourage private and public landowners/operators to develop ranch/farm plans, including grazing strategies and monitoring plans to support and accomplish their own stewardship actions.
- B. Encourage landowners/operators to include plans for management of multiple species of plants and animals in their ranch/farm plans.
- C. Develop an invasive weed management strategy for the watershed for the control of noxious weed species.
- E. Work with cooperators to reduce the spread and quantity of noxious weeds immediately.
- F. Develop protocols to identify and determine species, location, control methods, monitoring, citizen involvement, education, coordination with agencies and governmental entities, and impact of invasive weeds.
- G. Seek funding for a weed management strategy, partnering with all appropriate agencies, groups and landowners.
- H. Implement a weed management strategy for the Battle Creek watershed.
- I. Encourage landowners/operators to support sustainable oak woodlands with the assistance of the Hardwood Advisory Committee in Tehama County, and by understanding and following the Shasta County Oak Woodland Management Guidelines, (Board of Supervisors, Resolution No. 95-157)
- J. Facilitate dispersal of information about potential funding for landowner assistance for resolution of impacts identified on private lands.
- K. Support regulations and economic activities which will increase the viability of ranching as a long-term contributor to the economic base and lifestyle of the area.

VI. Strategy: Support forestland management practices which sustain healthy forestlands in the upper watershed and which, in turn, support local sustainable communities.

Action items:

- A. Encourage landowners to utilize sustained yield forest management to provide for the long-term economic health of the watershed community.
- B. Encourage landowners to use forest management activities that provide healthy vigorous forests, which create habitat for a diversity of species, reduce forest fuel loads that create conditions for catastrophic wildfires, and increase groundwater availability by reducing the transpiration rate.
- C. Encourage landowners to use resource management tools such as logging, prescribed fire, and biomass chipping to create and maintain shaded fuel breaks and defensible fuel profile zones, which also maintains a diversity of healthy wildlife habitat.
- D. Encourage USFS and private landowners to survey road systems within the watershed for erosion and other problems that impact water quality and other aspects of the watershed.
- E. Encourage the correction of problem areas and the maintenance of the road infrastructure to facilitate fire suppression, forest management and recreational activities. Close roads in sensitive areas, and discontinue roads that, because of poor road design, cannot be corrected and have a negative impact on water quality .

VII. Strategy: Encourage prefire management prescriptions to reduce wildfire impacts to natural resources and assets.

Action items:

- A. Encourage the use of VMP (Vegetation Management Plans) for both wildlife habitat improvements and a prefire management prescription to reduce the threat of wild fire.
- B. Encourage the use of shaded fuel breaks for wildfire protections. Implement, plan, and encourage strategic fuel breaks throughout the watershed.
- C. Continue to use controlled fire as a management tool to improve wildlife habitat and forage for domestic animals, for vegetation controls, including noxious weeds, and as a tool for wildfire protections.
- D. Seek cooperation among regulatory agencies to ensure the continued use of fire as a management tool until appropriate and economically viable alternatives for fuel management become available.
- E. Seek sources of funding for vegetation management plans and shaded fuel breaks with interested landowners.

VIII. Strategy: Support land use planning that supports sustainable communities and land uses throughout the Battle Creek Watershed.

Action items:

- A. Assess land use and zoning plans for the Battle Creek watershed as described in the Tehama County General Plan and the Shasta County General Plan.
- B. Encourage any expansion of new development within community spheres of influence.
- C. Encourage adoption of reasonable community growth boundaries to meet projected demands.
- D. Promote land use planning that supports the agriculturally based economy and open space throughout the watershed.
- E. Support mitigation of land use conflicts between watershed neighbors.
- F. Ask the Board of Supervisors and Planning Departments of each county to accept the BCWC Strategy as community input into future planning activities.

- IX. Strategy: Seek to protect in-basin water rights and support appropriate beneficial water use policies.**

Action item:

- A. Monitor planning activities of organizations, agencies and legislation that might impact any water rights in the watershed.

- X. Strategy: Strive to maintain and restore natural processes and functions throughout the watershed**

Action items:

- A. Protect meadow functions, riparian habitats, wildlife habitats and all interrelated natural processes, as well as stream flows.
- B. Protect the hydrology and geological functions of the area – specifically the aquifers - from disturbances, such as drilling and mining, to the ancient stream channels buried by lava flows (lava tubes)
- C. Develop opportunities for interested landowners to coordinate restoration projects, utilizing the assistance of experts familiar with the Battle Creek watershed.
- D. Set standards and monitor those standards.

- XI. Strategy: Encourage commercial outdoor recreational opportunities which support local sustainable economies and which operate within the constraints of adequate resource management protections.**

Action items:

- A. Encourage interested private landowners to provide a variety of viable recreational opportunities throughout the watershed.
- B. Seek appropriate lands for public access in the mid-range of the watershed to provide a broader range of available recreational opportunities, utilizing, whenever possible, existing public-owned lands.

XII. Strategy: Promote land and water stewardship through outreach and education.

Action items:

- A. Encourage landowners to seek ways to maintain the integrity of their ranch lands for future generations.
- B. Promote land and water stewardship through school education programs.
- C. Work with local schools to develop curriculum regarding the watershed.
- D. Promote land and water stewardship through community education programs
- E. Create a liaison between schools and the communities to encourage an open exchange of information and educational programs regarding the watershed.
- F. Seek to include more natural spawning, habitat and life cycle needs of salmon and steelhead in the Battle Creek watershed at the Return of the Salmon Festival.
- G. Continue producing a newsletter to inform local residents about watershed activities.

XIII. Strategy: Monitor plans and activities of organizations outside the watershed and evaluate proposed policies with regards to their local effects and implications.

Action items:

- A. Partner with local organizations with similar interests and concerns.
- B. Publish results of monitoring and research in the BCWC newsletter.

CONCLUSION

Community commitment to restoring the Battle Creek Watershed to a healthy, functioning state is high. The opportunity is here at the end of the 20th century, to make alterations to man's past actions and once again enable Battle Creek to be home to vast runs of chinook salmon and steelhead trout. It is an opportunity to use our best science to make the hydroelectric system more compatible with the habitat requirements of the fisheries and to ensure the naturally functioning processes of the watershed. This is an opportunity to accommodate both the needs and desires of mankind for development and economic growth with the essential requirements for a productive fishery and a healthy functioning watershed.

It is clear from the many public meetings that have been held by the Conservancy that local residents are interested in the health and well-being of their environment—in the appearance of the land, the health of the streams and forests, the health of the natural and hatchery produced fish populations, the health of the local economy—and that they would like to participate in the decisions which will affect the future of the area. Over and over the comment was voiced, “We like our way of life and would like to retain it for our children and our children’s children.” How to maintain the current “way of life” and ensure its survival in the future is the real issue for local people.

Battle Creek is about to undergo a major transformation to become one of the state's most important salmon and steelhead streams. As this transformation occurs, it is the goal of the Battle Creek Watershed Conservancy to listen to and represent the people of its watershed by being actively involved in the decision making process of the Battle Creek Restoration Project. It is only through active participation in the restoration process and the education of the citizenry of the watershed concerning the process that the Conservancy can achieve its mission, which is “to preserve the environmental and economic resources of the watershed.” This community strategy, then, is one step towards the achievement of this goal, one that will benefit the entire watershed.

**The Battle Creek Watershed Conservancy
Position on the Battle Creek Salmon
and Steelhead Restoration Program
and Related Activities, July 24, 2000**

The Battle Creek Watershed Conservancy Position on the Battle Creek Salmon and Steelhead Restoration Program and related activities

The purpose of this document is to outline the concerns which have led the Conservancy to consider withdrawing its support for the Battle Creek Salmon and Steelhead Restoration Program, the CNFH Barrier Weir improvement program, and the CNFH intake screening program.

This document outlines the issues which have led the Conservancy to feel that it has not been effective in communicating local issues to the agencies, and it suggests some actions which we believe will help the Restoration Program over the long term as well as secure the support of a large segment of the local community.

In providing this draft to the agencies we seek suggestions for actions by the agencies and the Conservancy which will help us achieve our goals. We want to keep the lines of communication open as long as possible, but since the Program implementation will be soon upon us the Conservancy must act now.

If the agencies treat this document as a target, and “prove” that the Conservancy positions and suggestions are “wrong” or “impractical” then we shall have accomplished nothing. We need to seek positive solutions to the problem, solutions which will help the community as well as provide the critical support necessary for the long-term success of the Restoration Program.

1. Introduction

When we began our public meetings in the watershed, in response to the advent of the Restoration Program, we learned that the following two concerns summarized the feelings of most of the residents toward the Program:

- A fear that the presence of endangered salmonids in the watershed would bring increased environmental regulation and enforcement to the area, with potentially serious effects upon local economic activities and even upon ordinary living conditions;
- A fear that local water rights would be adversely affected by the Restoration Program.

On the positive side, we learned that the most commonly expressed desire of the local residents was to keep the area more or less like it is now, with the scenic values associated with large ranches and wide-open spaces.

For three and one half years we have worked closely with the agencies, at great cost in energy and volunteer time, in an attempt to minimize the probability of the two negative effects cited, and to see if the Restoration Program could not somehow be used to help preserve the scenic values cited as important to the residents. The key to preserving the scenic values was thought to be conservation easements, which would preserve ranching as a viable economic activity in the watershed, and would thus help protect the fish as well as local scenic values.

Now that the Restoration Program is nearing its implementation phase, we can look back and see that all our work has had little or no impact:

- The Restoration Program has been focused very narrowly upon water acquisition and water management in the PG&E reaches of Battle Creek;
- Because of this narrow focus, issues which were important to the Conservancy and the citizens have been by and large rejected as outside the scope of the Program;
- As the cost of the program has continued to escalate, it has become clear that the agencies are so wrapped up in the implementation of the program that they have no time for or interest in local issues.

If we have had an effect upon the project it has been through our program of bringing information to the public, and bringing back issues to the agencies. Our many public meetings have helped calm down the watershed residents, and have thus provided an appearance of support for the entire program, which has no doubt helped the agencies to get funding for it.

But this appearance of “public support” is deceptive. After recent public meetings we hear people say that the meetings are a waste of time, that the agencies are not responsive to our concerns, and that the sources for funding to address our concerns will dry up once the concrete is poured. Based upon the history of this area, this suggests a future of increasing local mistrust of agency activities, increased poaching and vandalism, and sporadic fights over land development and other economic activities.

The Conservancy does not look forward to such a future any more than the agencies do, but this is the future in store for us if the Restoration Program is not well planned and well executed. What do we mean by this?

The Memorandum of Understanding (MOU) which defines the Restoration Program was developed between PG&E and the resource agencies. This agreement sets out the costs and benefits to PG&E and to the agencies; each signatory to the MOU can look at these costs and benefits and decide whether its participation is justified. PG&E made this decision, giving up some generation capacity in exchange for very significant capital improvements and important regulatory certainty for the future.

There was no such MOU for the local citizens, who also have costs and potential benefits from this program. The costs are environmental regulations and agency intrusion in the watershed; the benefits are uncertain – we had hoped for compensation for affected landowners in the form of conservation easements, a lacing together of Project and watershed residents’ interests, and so on. Now we find that the potential benefits are fading away while the costs to the residents are becoming increasingly clear.

So we have a big agency program, on the order of \$100 million, which has failed to consider real and perceived costs to the community. This failure jeopardizes the long-term success of the Restoration Program, because without public support and involvement none of us can hope to preserve the fish and the environment of the Battle Creek watershed over the long haul.

We cannot support this program in its present form. If you are going to implement this program, do it right: integrate the plan with other watershed activities, be responsive to local concerns, and protect this massive investment over the long term by providing meaningful environmental assistance to the watershed community.

It simply doesn't make sense to spend this amount of money without thinking about the future, and without thinking about the rest of Battle Creek, including its human inhabitants. We want the agencies to treat us as they have PG&E – we want our costs to be addressed, we want our benefits to be in proportion to our costs. If the balance sheet remains negative for our community, we have every right to refuse to cooperate. Furthermore, we then have the duty to refuse to support the program, because it would be a waste of the taxpayer's money for a project which will ultimately fail through lack of community involvement and support.

2. Issues which have helped to create a lack of faith in the agency activities

The negative feeling of the community toward the Restoration Program has not appeared out of nowhere – it is the result of the cumulative impact of many small events, brought to a crisis by the fact that the Restoration Program is in the last months of the design phase, and that Project implementation seems inevitable. Some of these problems result from the fact that the community is not very effective in bringing its concerns to the agencies, and the agencies haven't the faintest idea of how to talk to "folks." Whatever the causes, the following are some of the issues which are important:

- The Conservancy has worked hard for several years to bring information about the program to the community, and to bring back public concerns to the agencies. In the process we have the support of nearly one hundred dues-paying members, a rather remarkable number for our sparsely-populated area. But these members are expecting results – they have brought their problems to us, and if we can't help them then the membership will fade away, along with the apparent goodwill of the community toward the salmon. The fact is that when we look at the last three-plus years of work, we have not been successful. We don't have much to show the community, especially for the long term.
- As a result the feeling right now is clearly that the bottom line for the Restoration Program is a net negative impact upon community.
- The agencies do not seem to recognize or have any empathy for this negative impact. Perhaps this is the fault of the Conservancy, for not voicing our concerns loudly enough or often enough, but the public perception of agency apathy is clear.
- There is a distinct feeling that the various sources for funding our watershed community organizing, watershed assessment, etc. will go away as soon as Restoration Program construction is implemented. Residents will then be left with the burden of living and working with endangered species in the area. The agencies can promise PG&E that all will be well in the future – and the PG&E/agencies MOU does precisely that – but the local residents can be given no such assurances.
- We have been urging a watershed-wide, unified approach to planning for Battle Creek for at least two years now. It is clear that this will not happen under the current plan.
- The agencies have not been responsive to community concerns raised at public meetings. For example, the Restoration Program "scoping" meeting in January 2000 raised a long list of questions and issues, none of which have been addressed six months later.

- Many in the community feel that some agency personnel have not been responsive during public meetings, and that local speakers have been “put down” on several occasions.
- It is clear from some agency actions that “scenic impact” is not a consideration for project design, despite the fact “scenic values” has long been identified as a prime community concern.
- It is clear to the Conservancy and many local citizens, even if it is not clear to the agencies, that the activities at Coleman National Fish Hatchery are a critical part of the salmon problem of Battle Creek. The Conservancy is hoping that some of the management alternatives for CNFH raised during the recent “re-evaluation” will help separate the operations at the hatchery from the creek. But it now seems clear that the evaluation of these alternatives will not be complete when the concrete is poured for the Restoration Program. This does not make sense: the hatchery problems must be resolved as part of the planning for the Restoration Program. Don’t spend another \$50 million before you know whether it will work. This is a prime example of a complete absence of planning on the watershed scale.

3. The proposed solution

How do we respond to the concerns of the community in a meaningful way, without unduly delaying the Restoration Program? Our proposal must address the immediate problems, which mainly concern program planning, as well as the long-term needs of the community.

- For the short term, the agencies can fix what is in their power to fix right now – the items listed below in Section 4, and perhaps something from Section 5.
- The long term is more difficult, for the community will face the negative effects of the Restoration Program over the foreseeable future. We thus need to provide continuing help for the community over an indefinite time span. Our proposed solution is to create the Battle Creek Endowment, with funds from foundations and other private sources, acquired through the help of the agencies – with a goal of providing future funding to help local citizens and groups cope with the side effects of the Restoration Program. The Endowment is described in Sections 6 and 7.

4. Issues which need to be addressed by the agencies

Most of the time when a community concern is voiced it turns out that the agencies feel that the concern is “outside the scope of the Restoration Program.” The reason for this is the attempt by PG&E and the MOU agencies to keep the Program simple and concise, to make it easier to gain NEPA/CEQA and FERC compliance through the acquiescence of all five MOU agencies.

But the fact that the agencies have a reason for not responding to community concerns does not do the residents any good – somebody needs to respond, or the project is not good for the community.

The following list of issues sets forth only those issues which the agencies can fix. They may not want to fix them in all cases, but we want them to, and they have the power to do so.

- When planning the Restoration Program **look at Battle Creek as a whole**, including the upper watershed and the residents, to identify other actions that need to be taken to ensure the success of the Program. Create a top-level watershed-wide plan for the Restoration Program which does not ignore tough issues simply because it would offend another agency.
- Work hard to find a way of separating operations at CNFH from Battle Creek. Alternatives are available and they need to be tried. If it doesn't work out, and you can't fix it – move the hatchery, or much of its production. It doesn't make sense to have 100,000 hatchery salmon dying in Battle Creek without spawning, crowding out the wild fish, when there is unused spawning habitat in the Sacramento River.
- Don't even think of increasing the water diversion capacity of CNFH. We need to be thinking about reducing operations at CNFH, and moving some or all of their production elsewhere – not of increasing production. Reduce the scope of the “intake screening” program to just that – intake screening. Don't turn it into a \$5 million hatchery expansion plan.
- Short of blasting out the CNFH weir, at least install an inflatable weir, so that the hatchery presents the minimum obstruction to the wild fish for the maximum amount of the year.
- Help local trout hatcheries protect themselves from pathogens brought up Battle Creek by the wild fish.
- Find a way to plant trout in the PG&E canals after they are screened. Lots of folks fish in these canals. One way to do this would be to set up a bit of public land on a canal for a park, so CDF&G would be able to plant there.
- Don't be so cavalier about cost overruns on the Restoration Program. The managers throw around \$5 million here and \$5 million there, just assuming that CALFED will pick up the bill, when no one seems to have any money for conservation easements or other projects to help the community. The large program costs have themselves become an issue in the community.
- Put scenic values back into the design equation, with an architect involved. Often a bit of texture, or color, or a small design change can greatly reduce the visual impact of the Pharaonic amounts of concrete which the Restoration Program will pour. We don't need ugly gauging stations at our most scenic spots, or massively ugly concrete, or miles of chain link fence. We note that the ugliest building in the watershed was built by an agency. The watershed has survived over 100 years of ranching quite nicely, but we are concerned that its appearance may not withstand the “restoration” program.
- Give us some spots where the locals can see the salmon without bothering them. Otherwise these will be mythical fish, as all of Battle Creek from CNFH to Mineral or Shingletown is in private hands. If we are putting up with assorted environmental regulations because of these fish, we should at least be able to verify that they exist.

- Fund and build restoration structures in proportion to their need and usefulness for the project; do not spend massive amounts on structures which will be rarely used, when a much simpler, less costly, and less obtrusive solution would suffice.
- Identify roles for the community in the Restoration Program's adaptive management program. As things now stand there is no significant role for the community in gathering or analyzing the data which will measure the Program's success or problems, nor in deciding upon actions to take in response to the data – despite the fact that a community role could help get community involvement and “buy in.”

5. Other issues which may require other outside help in addition to agency assistance

The following issues are important both from the point of view of protecting the investment in the Battle Creek Salmon and Steelhead Restoration program, and in gaining public support for the program – but these issues may require foundation assistance in addition to support from the agencies:

- Number one is a funded program for conservation easements to compensate the owners of riparian land for being good to the fish and giving up their development rights. It would cost roughly \$10 million over a decade to put the most important (willing) ranches into such agreements. This investment is critical for the long-term survival of Battle Creek as a prime salmonid creek.
- A fear of future environmental regulatory actions is a major stumbling block to public acceptance of the Restoration Program. The best solution for this problem would be regulatory relief of the sort provided to PG&E by the MOU, but this does not seem feasible since we can't define precisely the situations where it would be needed. But perhaps the agencies can suggest ways in which possible future regulatory activities can be better defined, so that the residents have a better idea of their future prospects.
- Public projects are a tried and true way to gain the hearts and minds of the people – politicians have been doing this for thousands of years. In the case of Battle Creek, public projects which both protect the salmonids in the creek and provide a visible public benefit are obvious winners – such projects protect the huge investment represented by the Restoration Program, and compensate the local residents for the future uncertainties of environmental regulation. A number of such projects have been studied by the Conservancy and other local groups:
 - How about a local park for the middle reaches of Battle Creek? There is no public access to the local creeks between CNFH and Mineral or Shingletown, and the folks need access to a tributary where they could have some fun without hurting the salmon, so that they won't spend so much time trespassing in Battle Creek and spearing salmon for the barbecue. An integrated plan has been developed for a park which would address a number of significant local issues, while providing a venue for continued environmental education.

- All areas of the watershed can benefit from additional shaded fuel breaks. CALFED provided the Conservancy with \$11,000 for an initial fuel break in the Manton area, and public appreciation for this work has been high.
- A few dozen 10,000 gallon fire water tanks dispersed throughout the area would mean that a significant percentage of fire starts would be stopped locally. For example, the Rock fire of last year, which caused extensive evacuations in the Manton area, could have been stopped near its origin had such a tank been nearby.
- Improved recreational facilities would help the community while reducing the impact of local kids on Battle Creek.

6. The Battle Creek Endowment

The purpose of the Battle Creek Endowment is to provide modest funding, over an extended period of time, for local initiatives supportive of the Restoration Program and the environmental and economic needs of the community as expressed in the Battle Creek Watershed Strategy.

The local residents will have to live with endangered salmonids for the foreseeable future. Their needs for support and assistance will not stop with the completion of the Restoration Program infrastructure in the next three or four years. The Endowment is designed to provide this assistance over an indefinite term, at an expense of perhaps one-tenth of the Program cost.

- The Endowment fund is to be raised from foundations and other private sources with the help of the agencies involved in the Restoration Program (federal and state funds cannot be used for this purpose because of the indefinite nature of the endowment).
- A funding level of \$10 million is suggested, based roughly upon the funds required to create conservation easements on the most important riparian lands, though the fund would leverage, not fully fund, such easements.
- The Endowment would be held by a reputable NGO (perhaps The Nature Conservancy or some such responsible entity).
- The Endowment would spend about 5% of the current value of the endowment annually. This should give a long life to the Endowment, depending upon interest rates.
- The Endowment is intended to support projects with long-term value.
- Endowment funds would be disbursed with the advice of the agencies and the trustee NGO, which parties might have seats on the Endowment Board.
- The Endowment would be run by a Board, which could be related to BCWC, or could be independent.
- The Endowment would support proposals developed within the watershed, by local groups, individual landowners, etc., which support environmental efforts related to the Restoration Program or its side effects.
- The Endowment funds would revert to the trustee NGO in the event the local management of the Endowment disbanded.

- The Endowment could be extended with gifts, bequests and additional grants.

7. The potential uses of the Battle Creek Endowment

The purpose of the Endowment is to assist community groups and individual landowners to pursue actions supportive of the Restoration Project and in overcoming the negative impacts of endangered-species and other environmental regulation upon their economic or other activities (ranching, farming, aquaculture, and so on). Some of the potential uses for Endowment funds are the following:

- Matching funds for partial funding of conservation easements. The Endowment would not have the level of funding required to support conservation easements on its own – the matching percentage would be limited by the Endowment bylaws.
- Funding to support continuing analysis of the watershed to identify situations where remedial action may be required to achieve environmental goals.
- Modest amounts to help individuals and groups implement projects required to help them comply with the environmental consequences of the Restoration Program.
- Funds to help groups and individuals prepare applications for grants to support larger projects related to compliance with the environmental consequences of the Restoration Program.
- Matching funds for group or individual projects for work related to the environmental consequences of the Restoration Program.
- Funds to help provide technical expertise for groups or individuals for work related to the environmental consequences of the Restoration Program.
- Modest base funds to help watershed-interested groups stay active. This is not intended to fully fund groups such as the Conservancy, but rather to keep community groups alive until they can find other funding.
- Modest funds to assist in supporting social or educational programs which help the community adapt to the needs of the Restoration Program.
- Modest funds for the maintenance of public access and park areas.
- Modest funds for fencing, fuel breaks, and other activities in situations where they will be beneficial to the Restoration Program.

8. Risks of this approach

This action by the Conservancy clearly has its risks. Through our hard work for the community we have built up considerable respect, both locally and with agency personnel. We risk “blowing” this credibility by what some may take as impulsive, irresponsible action.

On the other hand, we should consider our credibility as our working capital, and we should be willing to risk it if the benefits are worth it. There is no point in being above the fray if we are unable to help the community achieve reasonable goals in exchange for

their support of the Restoration Program, and there is nothing to be gained by letting our community be damaged by a program which we cannot support in its current form.

The risk is worth taking if the goals – benefits for the community and long-term benefits for the Restoration Program – are worth it, and if the probability of success is sufficient.

- If the agencies are unwilling or unable to help us achieve this proposed solution, the BCWC will lose its credibility with its membership and, thereby, become ineffective in dealing with the agencies.
- If this approach is not successful the BCWC will probably lose support from the local residents, because we will have failed to bring a positive value to the community from the Restoration Program.
- This approach risks delaying the Restoration Program. However, a year's delay in the program is less important than making it a successful program over the long term.

If we are successful in convincing the agencies to adopt our comprehensive approach to restoration then we believe that the Program will benefit along with the community.

9. Summary

We believe that the watershed community will support the Restoration Program over the long term, and will endure the inevitable regulatory problems, provided that the program is well designed, and that a suitable provision is made to help the community comply with reasonable and needed environmental regulations. In order to achieve that better program design and those stronger program ties with the community it is necessary to bring to the agencies' attention the fact that the BCWC is prepared to publicly oppose the present form of the Restoration Program because of its institutional inadequacies.

Implement a well integrated program, provide for the residents, and everybody wins. Concentrate on the Restoration infrastructure without considering the impact upon the community, and you sow the seeds for a contentious future and failure of the Program.

**Battle Creek Watershed Conservancy Task List
(DRAFT), August 31, 2000**

Battle Creek Watershed Conservancy Task List (DRAFT)

The purpose of this document is to provide a defined list of tasks which together implement the short-term (10 year) vision of the Conservancy for the Battle Creek watershed fishery. By identifying specific tasks for the Conservancy, and tasks the Conservancy thinks appropriate for the agencies and other organizations involved in Battle Creek, we hope to clarify our vision by exposing it for detailed examination, comment, and suggestions by all concerned. The list will be revised as the issues are examined by all involved.

Obviously the Conservancy cannot dictate programs to the agencies or to other stakeholders. What we can do is to seek opportunities to enhance the environmental aspects of the watershed, and to examine alternatives proposed by others, and to determine what actions seem to make sense to us in terms of our goals, especially those goals expressed in the Battle Creek Watershed Community Strategy, a document which summarizes the concerns and interests of the local community as expressed in a long series of public meetings. When we have found actions which seem to meet our requirements, we will support these actions for funding and implementation. Where we find that actions are planned by others which do not seem to make sense, or are not well coordinated with other activities in the watershed, we will express this opinion wherever appropriate.

It may just be possible that the Conservancy and other stakeholders can reach something like consensus on most of the issues presented in this document, and then this list can become the basis of a partnership of mutual support among the stakeholders and agencies. If this can be achieved then the restoration of Battle Creek can go forward with strong momentum.

In that spirit we solicit ideas, criticisms, suggestions for new entries, etc. The tables provide space for the positive and negative aspects of each task, as well as required links with other tasks or agencies.

It may be useful to articulate in draft form a set of goals for the watershed, as seen from the Conservancy's point of view. These goals, which we believe are consistent with the Action Plan for Fishery Resources and Aquatic Ecosystems (USFWS, 1994) and similar goals of CDFG and NMFS, as well as the Battle Creek Watershed Community Strategy, may be categorized into long-term and short-term goals.

Long term goals:

- To provide habitat for natural production of the five anadromous races in Battle Creek from the Sacramento River to the natural limits of fish passage;
- To ensure that this habitat has substantially the maximum extent, quality, and fish passage possible given the natural physical properties of Battle Creek;

- To ensure that that natural production and habitat is not seriously encumbered by PG&E facilities and operations;
- To ensure that that natural production and habitat is not seriously encumbered by CNFH facilities and operations;
- To ensure that that natural production and habitat is not seriously encumbered by landowner facilities and operations;
- To ensure that these goals are accomplished without placing undue burdens upon local landowners and communities;
- To ensure that these goals are accomplished with the support of the local communities and other stakeholders involved;
- To ensure that the net benefit/cost ratio of the overall program for the local communities is positive;
- To ensure that these goals are protected over the long term through conservation easements, education, communication, and other means;
- To ensure that adequate supplemental hatchery production can continue as long as required;
- To ensure that the Battle Creek Working Group is maintained as a forum for planning and coordinating environmental activities on Battle Creek;
- To achieve these goals as much as possible through a partnership involving the Conservancy, other individual and commercial stakeholders, and the many resource and other state and federal agencies whose efforts are important to Battle Creek.

Short-term implementation goals:

- To ensure that the Restoration Program and other Battle Creek projects are implemented in a coordinated manner;
- To ensure that all Battle Creek projects are designed with due consideration to the watershed as a total system;
- To ensure that the Restoration Program and other Battle Creek projects are well designed, are appropriate for the functions served, have minimum visual impact upon the watershed, and are cost effective;
- To ensure that the Restoration Program and other Battle Creek projects are designed with open access for stakeholder input;
- To ensure that the needs and concerns of the community are communicated well to the agencies, and that the agencies are in turn responsive to these needs and concerns;
- To ensure, through a long-term educational program, that the local community members are well informed about their environment and their relationship with that environment;
- To encourage, through education and workshops, best-management practices for agriculture and ranching, good forest management practices, and good watershed stewardship;

- To ensure, through the provision of recreational access to the watershed, that the local community members can enjoy and relate to the unique Battle Creek watershed environment;
- To ensure, through the development of a watershed assessment, that the Conservancy is fully aware of the environmental needs in the watershed;
- To ensure that the needs of the local community for environmental assistance in the face of regulatory requirements can be met over the long term, through an endowment;
- To ensure that the local community is involved in agency activities on Battle Creek to the maximum extent possible;
- To provide visible benefits to the local community to offset to some degree the risks of future environmental regulation.

- **Tasks to be carried out primarily by the Battle Creek Watershed Conservancy**

Task Name	Descriptions	Advantages	Disadvantages	Externals
Top-level watershed vision	Look at the watershed as a single system, and encourage the agencies to do likewise, making maximum use of the BCWG	Better coordination among the many Battle Creek programs; create a long-term vision for salmonids in the watershed	Time and staff requirements	Cooperate with the agencies as well as other stakeholders (sport and commercial fishermen, CVPWA, landowners, etc.)
Endowment	Seek private funding for the Battle Creek endowment	Provides, over the long term, support for technical assistance to local landowners with environmental problems, modest funding for small restoration programs; provides insurance that the community will not be left without resources to comply with regulatory actions over the long term	Difficult to raise private funds of this type	Cooperate with TNC or other NGO to hold funds and provide backup in case BCWC goes away
Watershed assessment	Seek funding for and develop a watershed assessment	Defines areas/situations in the watershed potentially requiring assistance/remediation; can help BCWC get ahead of agencies on environmental violations; can help BCWC provide useful services to the watershed community	Time and staff requirements; funding	Learn from neighboring watershed assessments
Education	Continue the extensive educational program of the Conservancy, and reach out to parts of the community not yet heard from	Provides education on watershed issues for most of the community and helps ensure public support for the Restoration Program	Time and staff requirements; funding	Helps gain public support for the Restoration Program; cooperate with agencies to get "expert" assistance in educational programs
Park	Develop a local park site	Provides a visible public benefit; potential educational component; takes pressure off of Battle Creek riparian areas; improves public acceptance of Restoration Program	Cost, level of effort, long term support required; liability issues	Cooperate with many agencies to realize; Helps gain public support for the Restoration Program

Recreation	Provide local recreational opportunities with an educational component	Allows residents to experience the special values of the watershed; visible public benefit; helps gain public support for the Restoration Program	Funding; liability issues	Cooperate with PG&E, BLM, and other agencies to achieve this goal
Conservation easements	Cooperate with TNC and other organizations to seek willing sellers and funding	Conservation easements are the most important long-term protection available to the watershed; avoids future land use controversies; compensates ranchers for loss of development rights; makes ranching viable in the face of development pressure	Many landowners are reluctant to enter into these agreements; funding	Supports Strategy goal for scenic values and rural atmosphere
Newsletter	Provide general information to the public about the progress of the many programs on Battle Creek	Public information is badly needed, and it can "short circuit" the local rumor mills; considerable educational component; keeps people aware of the continuing need for environmental action	Time	Seek agency inputs for articles
Regulatory certainty	Cooperate with DFG and RWQCB to provide updates to the community on regulatory actions	Public information and workshops on these issues are quite important to the community; avoids "surprises" to local landowners	Time and staff requirements	Helps keep public support for the Restoration Program
Coordination	Coordinate the provision of technical and financial assistance to local landowners with environmental problems	The BCWC can provide a user-friendly interface between shy local landowners and the agencies whose help they need. The Endowment can be used to assist these landowners with technical assistance or modest funding.	Time and staff requirements	Coordination with many agencies required

Liaison	Continue close liaison with the agencies, the BCWG, and the public	Public concerns need to be brought to the attention of the agencies at the earliest opportunity	Time and staff requirements	Coordinate with neighboring watershed groups
GIS	Seek funding to extend the KRIS-Battle Creek GIS system to include additional layers and information, and make it available to schools and on the Internet	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	Seek GIS layer contributions from several agencies
Adaptive management program	Help develop a significant role for the BCWC in the adaptive management program	Provides some local control over monitoring; provides local input into the adaptive management process; provides local involvement with the Restoration Program	Time and staff requirements; difficult to find meaningful role for local residents and students	Cooperate with USBR, PG&E, USFWS, DFG
CNFH re-evaluation	Provide substantial input during the development of the re-evaluation study	Stakeholder concerns can be made part of the investigation at an early stage	Time and staff requirements	Seek stakeholder input
Gover Ditch proposal	Help coordinate the development of a proposal to evaluate the Gover Ditch as an alternative connection between CNFH and the Sacramento River	Potential to provide substantial separation between CNFH operations and Battle Creek; could be highly beneficial for natural populations in BC	Questions have been raised about whether enough salmon will use the ditch; Close cooperation with ditch owners required	Need to coordinate with CNFH and the re-evaluation program
Fuels management	Seek funding for and implement a program of fuels reduction and other measures (tanks, etc.)	Provides a visible benefit to the community; provides reduction in wild fire hazard for the watershed	Funding	Helps gain public support for the Restoration Program; cooperate with CDF, LNF, SPI, etc.
Liaison with other watershed groups	Liaison with other Sacramento River area watershed groups	Learn from the success/failure of other groups to minimize re-inventing the wheel	Time and staff requirements	Proposed Battle Creek activities affect upper Sacramento

Tasks to be carried out primarily by CDF&G

Task Name	Descriptions	Advantages	Disadvantages	Externals
Water purchase	Purchase all or part of 13 cfs right from willing seller and dedicate to environmental uses	Reduces water and screening requirements at CNFH; adds dedicated water to Battle Creek	Cost (but net cost may be small, when reduction in CNFH screening cost is taken into account)	Coordinate with CNFH intake design
Effluent use on wetland	Direct all or part of CNFH effluent onto DFG wetland	Reduces pollution in Battle Creek; potential beneficial effects on wetland growth	Minor costs	Must be coordinated with Gover Ditch operations
Lower Battle Creek riparian improvements	Re-form riparian areas on lower Battle Creek where the creek has become channelized	Improves riparian habitat;	Cost	Need to coordinate with local landowners
Gover Ditch proposal	Coordinate the development of a proposal to evaluate by experiment the Gover Ditch as an alternative connection between CNFH and the Sacramento River	Potential to provide substantial separation between CNFH operations and Battle Creek; could be highly beneficial for natural populations in BC	Questions have been raised about whether enough salmon will use the ditch; Close cooperation with ditch owners required	Need to coordinate with CNFH and the re-evaluation program
CNFH re-evaluation	Provide substantial input during the development of the re-evaluation study	DFG concerns can be made part of the investigation at an early stage	Time and staff requirements	
Pathogens	Consider using certified stock for planting local creeks	Better protection for local hatchery operations	Cost	Coordinate with Mt. Lassen Trout, CNFH, Darrah Springs
Canal stocking	Work with the BCWC to find a way to stock some PG&E canals	Important for local sports and commercial fishing	Cost; need to stock at public sites	Coordinate with PG&E
Viewing sites	Cooperate with USBR to provide their Battle Creek viewing sites with educational components	Gives the public a chance to see the creek, and perhaps the fish, in a situation where they are not likely to harm the fish; provides educational opportunities	Cost; liability issues	Coordinate with USBR

Adaptive management program	Help develop a significant role for the BCWC in the adaptive management program	Provides some local control over monitoring; provides local input into the adaptive management process; provides local involvement with the Restoration Program	Time and staff requirements; coordination required	Cooperate with USBR, PG&E, USFWS
Park	Consider the possibility of assisting the BCWC in their park project, particularly regarding the educational component	Visible asset to the community; possible educational aspects	Capital cost; operating cost; liability issues	
Conservation easements	Consider cooperating with BCWC to seek willing sellers and funding	Conservation easements are the most important long-term protection available to the watershed	Cost; many landowners not willing at this time; staff time	Coordinate with TNC and other NGOs
Fishing regulations	Continue cooperation with the BCWC to keep the public informed of probable future policies	Public information on this issue is important for the residents, to avoid surprises; get stakeholder involvement in regulation process	Staff time	
GIS	Cooperate with BCWC to add GIS layers to the KRIS-Battle information system	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	

Tasks to be carried out primarily by USFWS

Task Name	Descriptions	Advantages	Disadvantages	Externals
Barrier weir	Take likely hatchery management alternatives into account during design, to optimize natural production	Allows minimum inflatable dam; no change required in fish ladder; cost savings	Possible delay	Enhances natural production
Intake design	Re-evaluate options for lower-cost design, based upon 109-cfs water right	Cost savings; puts to rest public concern over CNFH water right	Some delay in construction; possible delay in funding	
Move late-fall production (potential)	Transfer all or part of CNFH late-fall production to Livingston Stone facility	Reduces water requirements at CNFH; reduces time barrier weir needs to be closed; takes advantage of unused habitat in upper Sacramento; takes advantage of trap infrastructure at Keswick and gravel program; imprints late-fall on Sacramento; in-kind, in-place mitigation	May require expansion of Livingston Stone; further divides CNFH staff; cost	May reduce screening requirement at CNFH; allows lower-density raising of fall run at CNFH
Move steelhead production (potential)	Transfer all or part of CNFH steelhead production to Livingston Stone facility	Reduces water requirements at CNFH; reduces time barrier weir needs to be closed; takes advantage of unused habitat in upper Sacramento; takes advantage of trap infrastructure at Keswick and gravel program; imprints steelhead on Sacramento; imprints late-fall on Sacramento; in-kind, in-place mitigation	May require expansion of Livingston Stone; further divides CNFH staff; cost	May reduce screening requirement at CNFH; allows lower-density raising of fall run at CNFH
Viewing sites	Cooperate with USBR to provide their Battle Creek viewing sites with educational components	Gives the public a chance to see the creek, and perhaps the fish, in a situation where they are not likely to harm the fish; provides educational opportunities; improves public acceptance of Restoration Program	Cost; liability issues	Coordinate with USBR, BCWC

Adaptive management program	Help develop a significant role for the BCWC in the adaptive management program	Provides some local control over monitoring; provides local input into the adaptive management process; provides local involvement with the Restoration Program	Time and staff requirements	Cooperate with USBR, PG&E, DFG
Gover Ditch proposal	Cooperate in the development of a proposal to evaluate the Gover Ditch as an alternative connection between CNFH and the Sacramento River	Potential to provide substantial separation between CNFH operations and Battle Creek; could be highly beneficial for natural populations in BC; could reduce limits on CNFH production caused by need to protect natural spawning population	Questions have been raised about whether enough salmon will use the ditch; Close cooperation with ditch owners required	Need to coordinate with DFG and BCWC
Park	Consider the possibility of assisting the BCWC in their park project, particularly regarding the educational component	Visible asset to the community; possible educational aspects	Cost; liability issues	
Conservation easements	Consider cooperating with BCWC to seek willing sellers and funding	Conservation easements are the most important long-term protection available to the watershed	Cost; many landowners not willing at this time; staff time	Coordinate with TNC and other NGOs
Water requirements	Settle the matter of water requirements through the intake design	Puts contentious issue to rest; reduces cost of intake project	Possible loss of flexibility	
GIS	Cooperate with BCWC to add GIS layers to the KRIS-Battle information system	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	

Tasks to be carried out primarily by USBR

Task Name	Descriptions	Advantages	Disadvantages	Externals
Restoration Program visual impact	With the aid of a landscape architect and computer models, evaluate and minimize the visual impact of Restoration Program features	Better public acceptance of the Restoration Program; less impact upon the watershed	Small increase in cost	Coordinate with stakeholders
Restoration program costs	Verify the cost-benefit ratio of low-usage infrastructure	Shows the public that the planning was cost sensitive	Cost, time	Use BCWG as much as possible
Restoration Program EIS/EIR	Extend EIS/EIR to include cumulative impacts	Brings related but out-of-scope issues out in the open for full discussion	Cost	Coordinate with stakeholders to identify issues
Restoration Program concurrency	Resolve Restoration Program and CNFH issues concurrently prior to final EIS/EIRs	Concurrent resolution allows global planning	Possible delay	Requires considerable coordination, which is facilitated by the fact that USBR is the contracting agency for CNFH activities as well as the Restoration Program
Viewing sites (1)	Install some viewing sites for Battle Creek	Gives the public a chance to see the creek, and perhaps the fish, in a situation where they are not likely to harm the fish; provides educational opportunities	Cost; liability issues	Cooperate with USFWS and DFG
Viewing sites (2)	Consider developing with PG&E a public viewing site at a PG&E facility (Coleman dam site?)	Visible asset to the community; potential educational component	Access; liability issues	Cooperate with PG&E and the BCWC
Pathogens	Develop protection measures for local hatchery operations, and partially fund using cost shares	Protects and important local industry; improves public perception of the Restoration Program	Cost	Coordinate with Mt. Lassen Trout Farms, DFG
Park	Consider the possibility of assisting the BCWC in their park project	Visible asset to the community; possible educational aspects	Cost; liability issues	

Conservation easements	Consider cooperating with BCWC to seek willing sellers and funding	Conservation easements are the most important long-term protection available to the watershed	Cost	
CNFH issues forum	Address issues of controversy in open forum	Brings concerns into open discussion		Cooperate with other agencies
Watershed assessment	Assist BCWC in funding a watershed assessment	Defines areas/situations in the watershed potentially requiring assistance/remediation; can help BCWC get ahead of agencies on environmental violations; can help BCWC provide useful services to the watershed community	Cost	Use BCWG as much as possible
Barrier weir project	Take into account the likely CNFH operations in the design, and minimize the weir impact on the creek; try to resolve some re-evaluation issues early to avoid delay	Probable cost reduction due to operation of the weir only during fall-run passage; no need for new ladder		Coordinate with stakeholders
Intake project	Take into account the likely CNFH operations in the design, and minimize the weir impact on the creek; try to resolve some re-evaluation issues early to avoid delay	Probable cost reduction due to reduced flow requirements and alternative design	Possible delay; additional costs due to re-design requirement	Coordinate with stakeholders
GIS	Cooperate with BCWC to add GIS layers to the KRIS-Battle information system	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	

Tasks to be carried out primarily by the Pacific Gas & Electric Company

Task Name	Descriptions	Advantages	Disadvantages	Externals
Education	Cooperate with the BCWC in their "your watershed at work" program for the hydropower portion	Gives students a better picture of the role of hydropower in the community and the environment	None	Involve adults as much as possible
Park	Consider the possibility of assisting the BCWC in their park project	Visible asset to the community; possible educational aspects; helps gain support for the Restoration Program	Cost; liability issues	Coordination required
Recreation	Consider cooperating with the BCWC in providing additional recreational facilities at PG&E sites	Visible asset to the community; helps gain support for the Restoration Program; possible educational aspects	Cost; liability issues	Coordination required
Viewing site	Consider developing with USBR a public viewing site at a PG&E facility (Coleman dam site?)	Visible asset to the community; potential educational component	Access; liability issues	Coordination required

Tasks to be carried out primarily by The Nature Conservancy

Task Name	Descriptions	Advantages	Disadvantages	Externals
Conservation easements	Continue cooperating with BCWC to seek willing sellers and funding	Conservation easements are the most important long-term protection available to the watershed	Cost; many landowners are not yet willing to enter into these agreements; long-term program required	Coordination with other agencies for funding
Education	Cooperate with BCWC to provide education regarding conservation easements as well as environmental and ranching issues	Critical part of conservation easement program; opportunity for educational programs on ranch issues	Time	
Park	Consider the possibility of assisting the BCWC in their park project	Visible asset to the community; possible educational aspects; excellent chance to gain local support for the Restoration Program	Cost; liability issues	Coordination with other agencies will be required
Endowment	Assist the BCWC in the search for private funding; provide long-term backup as holder of funds	Important long-term insurance for community against unknown future regulatory activity	Difficult to find such funding; program will have to be long term	

Tasks to be carried out primarily by the Bureau of Land Management

Task Name	Descriptions	Advantages	Disadvantages	Externals
Conservation easements	Consider cooperating with BCWC to seek willing sellers and funding	Conservation easements are the most important long-term protection available to the watershed	Cost; a long-term program is required, as many landowners are not ready to enter into such agreements	
Park	Consider the possibility of assisting the BCWC in their park project, possibly as holder of property title	Visible asset to the community; possible educational aspects; helps gain public support for the Restoration Program	Cost; liability issues	Requires coordination with other agencies
Noxious weeds	Consider the possibility of assisting the BCWC in their noxious weeds project	Potential cooperation important to restore working relationship between BLM and BCWC		Coordination with ranchers required
Land holdings	Consider land trades or sales to reduce number of small or included parcels in ranching area	Important action for the viability of ranching; possible BLM purchase of non-ranching lands of riparian importance		
GIS	Cooperate with BCWC to add GIS layers to the KRIS-Battle information system	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	

Tasks to be carried out primarily by the Battle Creek Working Group

Task Name	Descriptions	Advantages	Disadvantages	Externals
Coordination	Continue serving as the public forum for Battle Creek environmental issues, expanding from the Restoration Program to the creek as a whole system	The right mix of stakeholders and agency personnel are already available in the Working Group	Time, though meetings would become less frequent as the Restoration Program moves from implementation to the adaptive management phase	
Adaptive management	Take a leadership role for the non-MOU stakeholders in overseeing the adaptive management program	The Working Group includes the MOU agencies as well as the non-MOU stakeholders, so it is the ideal platform to maintain oversight over the adaptive management program	The MOU agencies have the legal obligation to manage the adaptive management program, so non-MOU stakeholders have only an informal advisory role. This may keep some stakeholders from participating.	Coordinate with out-of-area agencies to extend the scope of consideration to a broader range of stakeholders

Tasks to be carried out primarily by the Regional Water Quality Control Board

Task Name	Descriptions	Advantages	Disadvantages	Externals
GIS	Provide funding to the BCWC to add GIS layers to the KRIS-Battle information system and to make that system available in local schools and on the Internet	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	
Non-point-source pollution	Cooperate with The BCWC to provide local workshops in the watershed to inform the ranching, aquaculture, and agricultural community of regulations and remedies for pollution problems	Non-point-source pollution is considered by many in the community to be a potential threat, and educational programs can do much to convert this fear into reasonable compliance actions; technical information on compliance is an important part of this education	Time and staff requirements	Coordinate with ranchers and other affected stakeholders
Education	Provide funding to the BCWC for educational programs	Education to acquaint the students with the environmental characteristics and needs of their community is one of the best long-term strategies available for protecting the watershed	Cost	

Tasks to be carried out primarily by California Division of Forestry

Task Name	Descriptions	Advantages	Disadvantages	Externals
Fuels (1)	Continue the fuel management practices in the Manton area (shaded fuel break); seek funding for other fuels management programs in all areas of the watershed	Fuels management is seen as an excellent public benefit by the local residents; gains acceptance for the Restoration Program; reduces the probability of wildfire in the watershed, and thus provides some protection for the salmonids	Costs	
Fuels (2)	Consider seeking funding for a "fire safe" program in the Manton area	The "fire safe" program has been quite successful in the Shingletown area	Costs	
GIS	Cooperate with BCWC to add GIS layers to the KRIS-Battle information system	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	

Tasks to be carried out primarily by Lassen National Forest

Task Name	Descriptions	Advantages	Disadvantages	Externals
Fuels (1)	Continue the fuels inventory study now in progress on the LNF portions of the Battle Creek watershed	The result of this inventory can be used to seek funding for fuels-management work	None (already funded)	
Fuels (2)	Seek funding for fuels management activities suggested by the fuels (1) study above	Fuels management is seen as an excellent public benefit by the local residents; gains acceptance for the Restoration Program; reduces the probability of wildfire in the watershed, and thus provides some protection for the salmonids		
GIS	Cooperate with BCWC to add GIS layers to the KRIS-Battle information system	The KRIS-Battle information system can be used by the BCWC, BCWG, the agencies, and the public to support educational and planning activities relating to the watershed environment	Cost	

Tasks to be carried out primarily by the National Marine Fisheries Service

Task Name	Descriptions	Advantages	Disadvantages	Externals

**Managing Risk to Facilitate the Success of the
Battle Creek Salmon and Steelhead Restoration
Project, January 29, 2001**

Managing Risk to Facilitate the Success of the Battle Creek Salmon and Steelhead Restoration Project

A proposal for protecting the public investment in the Battle Creek Salmon and Steelhead Restoration Project, and for improving local public acceptance of the Project, by independently evaluating potential risks to the Project and by shaping appropriate science-based responses to them

prepared by the

Battle Creek Watershed Conservancy

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January 29, 2001



**B a t t l e C r e e k W a t e r s h e d
C o n s e r v a n c y**

Post Office Box 606, Manton, California, 96059

CONTENTS

1. Background	3
2. Scope of work	5
3. Task 1	7
<i>Evaluate the risks of dry-season production of late-fall-run chinook salmon and steelhead at the Coleman National Fish Hatchery to both the Restoration Project and upper Sacramento River natural salmon and steelhead populations</i>	
4. Task 2	11
<i>Evaluate the risks of the production of fall-run chinook salmon to the Restoration Project and the potential benefits of previously identified alternatives</i>	
5. Task 3	14
<i>Organize and conduct a symposium to enable full consideration by both the scientific community and the general public of the findings and recommendations resulting from the proposed project</i>	
6. Task 4	15
<i>Public dialog and outreach to ensure that the project efforts and outcomes are brought to the attention of the local community</i>	
7. Deliverables and schedule	16
8. Key project personnel	17
9. References	18
10. Project budget summary	19

1. BACKGROUND

The Battle Creek Salmon and Steelhead Restoration Project is the Federal-State (CalFed) Central Valley Ecosystem Restoration Program's best opportunity to restore naturally-spawning runs of winter-run, spring-run, and late-fall-run chinook salmon and steelhead to the San Francisco Bay-Delta watershed. The project, currently in advanced planning stages at the U.S. Bureau of Reclamation's Sacramento offices, will remove five Pacific Gas and Electric Company (PG&E) dams from, and will restore flows and access for salmon, to over 42 miles of stream habitat in Battle Creek, a tributary to the Sacramento River rising in Shasta and Tehama counties. The project is being funded by the CalFed program (\$27 million); PG&E (\$20+ million) and the David and Lucile Packard Foundation (\$3 million).

A number of highly-regarded CalFed ecosystem restoration proposals in other watersheds have run headlong into fatal landowner opposition. The landowners and other interested parties in the Battle Creek watershed have taken a different approach, forming a non-profit corporation (The Battle Creek Watershed Conservancy) to engage with the agencies in the planning process, hoping to help shape the Project into one that could benefit (or at least not harm) the local economy. After all, the same environment which can support the salmon (low-density rural atmosphere, large parcel sizes devoted primarily to cattle ranching) also provides the scenic values which attracted many of the residents.

After four years of work, dozens of public meetings, countless agency meetings, and significant educational outreach programs by the Conservancy, many of the fears of the local community have been laid to rest through the process of investigation, cooperation, and compromise. But a fundamental skepticism about the Restoration Project remains unaddressed throughout the community.

This skepticism is grounded on the large amount of money being spent on the fish, and on the fact that the Restoration Project focuses narrowly on the PG&E hydropower project. Local residents recall how abundant the spring-run salmon were in the area, as recently as 1980 and some 80 years after the hydropower dams were installed – and then how the salmon disappeared when the fish ladders on the dams were closed to “protect” the water supply of Coleman National Fish Hatchery (CNFH). Rightly or wrongly, many in the community have come to associate the reduction in the natural salmon population with CNFH, especially with the adverse effects of the hatchery's barrier weir and closure of the fish ladders.

Whether or not this perception is correct, all parties agree that local support is critical for the success of the Restoration Project: after all, the local residents will be the de-facto trustees of the ESA-listed and other anadromous fish in their backyards. Unless the residents are convinced that all reasonable measures are being taken to reduce the risk of failure of the Restoration Project, they are very unlikely to support the Project. Should the project fail many residents fear that the resource agencies will look toward curbing land uses and water rights in their attempts to rescue an endangered species. The biological risks to the Restoration Project that the landowners perceive from their knowledge of the stream and its fish are, therefore, turning into a political risk that threatens landowner support for the Restoration Project.

The resolution of this local concern requires a serious response, and the Conservancy has argued for some years that the planning of the Restoration Project should include a full analysis of the potential impact of the hatchery upon the natural production of the five anadromous runs to be restored in Battle Creek, as part of an overall watershed analysis.

A part of the solution to this problem will be provided by the CNFH re-evaluation program currently underway. Several hatchery management alternatives, which could mitigate potential impacts of artificial propagation upon natural production in Battle Creek, will be examined during the coming year.

The Conservancy is participating vigorously in the re-evaluation program, but due to the number of management alternatives being reviewed by the CNFH subcontractor (Harza Inc.), and the limited funds available, we feel that some of the issues most critical to the local community may be overlooked, and will require further study before the potential risks to the Restoration Project can be properly evaluated.

What is needed to supplement the ongoing work at CNFH is an objective, science-based analysis of the potential risks to the Restoration Project posed by the operation of a very large hatchery on a relatively small stream critical for natural production. To avoid assumptions of bias by local residents, this analysis needs a clearly-visible independence from the hatchery operators.

We propose that the issues be evaluated by qualified outside experts, who will consult closely with the Battle Creek-interested agencies and communities, including Harza Inc., and then submit their findings to an open symposium to be organized by the Conservancy and to involve additional scientific authorities on other pertinent subjects.

By means of the thoroughness with which the issues will be evaluated and the openness with which the research results will be reviewed at the symposium, the Conservancy hopes that mid-course corrections based upon the best available science can be made in Battle Creek restoration efforts so that the watershed community's flagging confidence in the Restoration Project can be restored.

Should the research prove that the hatchery poses no significant risk to the planned restoration, then the community will know that this result has been verified independently by the researchers cooperating with the Conservancy. On the other hand, should significant risks be predicted by the investigation, appropriate changes will be suggested to improve the success of the Restoration Project.

The landowners share with other stakeholders and the resource agencies the goal of restoring the productivity of Battle Creek. They, perhaps more than any of the other parties, want the Restoration Project to succeed. The work proposed here should contribute substantially to that goal.

2. SCOPE OF WORK

While the focus of this project is to address the concerns of the local community, these concerns about potential risks to the Restoration Project are also shared by other Battle Creek stakeholders, including sport and commercial salmon fishermen and Central Valley-Delta water users. These three groups – the landowners, fishermen, and water users – together with PG&E and the resource agencies formed the Battle Creek Working Group in early 1997. It was the Working Group that produced the 1999 Battle Creek Salmon and Steelhead Plan (Ward and Kier, 1999a) that defined the current Restoration Project.

A second Working Group product, Maximizing Compatibility Between Coleman National Fish Hatchery Operations, Management of Lower Battle Creek, and Salmon and Steelhead (“Compatibility Report”, Ward and Kier, 1999b) drew on the stakeholders’ knowledge of local conditions and upon consultations with fisheries and hatchery experts throughout California and the Pacific Northwest to identify a number of concerns that CNFH’s operations on lower Battle Creek raise relative to efforts to restore naturally-reproducing salmon and steelhead populations in the watershed.

The issues raised in the Compatibility Report have not been addressed in the planning of the Restoration Project, since this planning was confined to the reach of Battle Creek above Coleman National Fish Hatchery. The focus of this proposal is to supplement the ongoing work of the hatchery re-evaluation program through the development of an objective, independent analysis of the risks posed by the hatchery to the Battle Creek salmon and steelhead restoration effort, to enable the development and evaluation of science-based measures for reducing or eliminating any risks found to be significant.

Because many of the proposed tasks are supplementary to the ongoing CNFH re-evaluation program, being implemented at Harza Inc., it is important that those performing the analyses maintain close contact with Harza personnel, in order to avoid duplication of effort and to have a maximum exchange of ideas and interpretations.

The members of the project team are highly-qualified individuals who are, for the most part, from outside the project area and who can approach Battle Creek problems and solutions with a degree of independence impossible for those of us who have worked so long on the Restoration Project.

The proposed project tasks are listed in the table below and in the narrative that follows:

1.0 Risks posed by summer and fall production at CNFH

- 1.1 Impact of the CNFH barrier weir on natural production
- 1.2 Impacts of CNFH water use and intakes on natural production
- 1.3 Impacts of hatchery steelhead production
- 1.4 Assessment of the benefits and costs of relocating CNFH warm-season production
- 1.5 The effects of juvenile release sites on the Sacramento River fishery

2.0 Risks posed by fall-run chinook production at CNFH

- 2.1 The impact of superimposed redds on natural production
- 2.2 Impact of waste loading of Battle Creek by fall-run carcasses
- 2.3 Disease risk to natural production due to hatchery production

2.4 Evaluation of means to isolate CNFH from Battle Creek

3.0 Planning and execution of a symposium for project reporting

4.0 Public outreach to make the results of the project available to the community

Note that for tasks 1 and 2 the draft findings and recommendations should be suitable for distribution and discussion at the symposium (Task 3) on Battle Creek salmon and steelhead conservation to be convened by the Battle Creek Watershed Conservancy.

3. Task 1. Evaluate the risks of dry-season production of late-fall-run chinook salmon and steelhead at the Coleman National Fish Hatchery to both the Restoration Project and upper Sacramento River salmon and steelhead populations

Dry-season production at Coleman National Fish Hatchery is limited to the culture of late-fall chinook salmon and steelhead. This production begins with broodstock collection of late-fall chinook and steelhead from November through March, and continues with juvenile rearing which spans the dry season (July through September). Such production requires roughly half the summer flow of Battle Creek, and necessitates the operation of a barrier weir to collect late-fall chinook and steelhead during the period of November-March.

CNFH previously attempted to culture winter-run chinook, a species now protected under the federal Endangered Species Act, but high hatchery water temperatures precluded optimal production, and after a campaign by the Working Group, production was moved in 1998 to Livingston-Stone Hatchery at Shasta Dam. Production at this site has proven highly successful.

Should the work done under this project find that dry-season production at CNFH poses a significant risk for the Restoration Project, the Conservancy and other stakeholders have suggested that the same remedy – moving dry-season production to Livingston-Stone Hatchery – should be seriously considered. Such a move would populate 29 miles of excellent, under-utilized habitat in the upper Sacramento River with steelhead and late-fall chinook, taking advantage of a \$500 million public investment (Shasta Dam temperature control device, Iron Mountain mine runoff mitigation, spawning gravel program, Keswick fish trap improvements) to restore this river reach.

Task 1.1: Impact of the CNFH barrier weir operations from November through March

The hatchery's barrier weir across Battle Creek, operated to capture salmon and steelhead for hatchery use, impedes the upstream migration of salmon and steelhead to about 90 percent of the Battle Creek watershed, including the Restoration Project area. The practice of blocking fish with this small dam, and holding migrating adult fish in hatchery ponds, has caused mortalities of adult steelhead of 25 to 40 percent. Such mortalities, were they allowed to continue, would severely hamper the restoration of natural runs of steelhead to upper Battle Creek.

To accomplish this task we propose to perform the following subtasks:

- Consult with CNFH personnel and others;
- Collect and analyze information concerning pre-spawning mortality of steelhead and other runs blocked by the hatchery barrier weir;
- Collect and analyze information concerning the impact of the barrier weir operation upon the passage of juvenile populations;
- Review plans for continued operation of the weir;

- Evaluate the impact of continued weir operations on plans for the restoration of anadromous fish upstream of the weir;
- Prepare and issue draft findings and recommendations for reducing negative impacts, if any, of weir operation on upstream anadromous fish restoration efforts.

Task 1.2: Impacts of CNFH water use and intakes on natural production

The hatchery requires approximately 50% of the dry-season flow of Battle Creek, and maintaining the current production mix will require extensive improvements to the hatchery water intake system while decreasing the amount of water available for salmonid rearing and migration from the Restoration Project area. This task addresses the potential impacts of hatchery water use, and the possible benefits which could accrue from transferring dry-season production to Livingston-Stone Hatchery.

To accomplish this task we propose to perform the following subtasks:

- Consult with CNFH personnel and others;
- Collect and analyze information concerning CNFH's dry-season water requirements;
- Evaluate the water use costs and the benefits, if any, of transferring juvenile steelhead and late-fall-run chinook salmon production from CNFH to Livingston Stone Hatchery;
- Evaluate fisheries management/restoration costs and the benefits, if any, of transferring juvenile steelhead and late-fall-run chinook salmon production from CNFH to Livingston Stone Hatchery;
- Evaluate the benefits, if any, of reducing CNFH diversions from Battle Creek;
- Evaluate CNFH's current plans for upgrading its water intake system and recommend measures for lessening the impact, if any, of such plans on the Battle Creek ecosystem;
- Issue draft findings and recommendations for reducing negative impacts, if any, to the Restoration Project of continued dry-season water withdrawals from Battle Creek to CNFH, and of the benefits to Sacramento River natural production, if any, of transferring juvenile steelhead and late-fall-run chinook salmon production from CNFH to Livingston Stone.

Task 1.3: Impacts of hatchery steelhead production

The hatchery produces about 1 million steelhead juveniles each year. Concerns have been raised about possible genetic and ecological effects of this production upon the natural production expected in Battle Creek following the Restoration Project.

To accomplish this task we propose to perform the following subtasks:

- Consult with CNFH personnel and others;
- Collect and analyze information concerning the impact of CNFH steelhead production, to the extent that it can be determined, on the growth, survival, and

genetic stability of steelhead that will be produced naturally in the Restoration Project reaches of Battle Creek;

- Issue draft findings and recommendations for minimizing the adverse impacts, if any, of continued CNFH steelhead production on the success of steelhead restoration in upper Battle Creek

Task 1.4: Assessment of the benefits and costs of relocating CNFH dry-season production

Should it be determined that CNFH dry-season operations have a significant impact upon natural production and thus pose a risk to the success of the Restoration Project, the costs, benefits, and risks of alternatives need to be considered. The alternative suggested by the Conservancy and other stakeholders involves moving dry-season CNFH production to an expanded Livingston-Stone Hatchery at Shasta Dam. This task considers this alternative in some detail.

To accomplish this task we propose to perform the following subtasks:

- Consult with CNFH and USBR personnel and others;
- Estimate the costs of transferring CNFH juvenile steelhead and late-fall-run chinook salmon production to Livingston Stone Hatchery in terms, at minimum, of constructing and outfitting additional Livingston Stone Hatchery capacity, loss of power generation at Shasta Dam, and reduced efficiency of CNFH operations;
- Estimate the benefits, if any, on natural production, sports fishing, and commercial fishing due to the increased natural populations of late-fall chinook and steelhead in the upper Sacramento River;
- Determine the benefits, if any, of reduced dry-season power consumption at CNFH attributable to transferring CNFH juvenile steelhead and late-fall-run to Livingston Stone;
- Issue draft findings and recommendations concerning proposals for transferring CNFH's juvenile steelhead and late-fall-run to Livingston Stone.

Task 1.5: The effects of juvenile release sites on the Sacramento River fishery

One potential consequence of the alternative hatchery site studied in Task 1.4 is that hatchery late-fall chinook and steelhead could be released at sites along the Sacramento River. Releases at a site in the Redding area could potentially populate the upper 29 miles of the Sacramento River above Battle Creek with late-fall chinook and steelhead, with potential natural production by those fish not needed for hatchery production. This reach of the river has been the subject of extensive restoration, and there are large amounts of excellent-quality underutilized habitat.

To accomplish this task we propose to perform the following subtasks:

- Consult with U.S. Fish and Wildlife Service, California Department of Fish and Game personnel and others;
- Identify the likely advantages and disadvantages, if any, of releasing juvenile salmon and steelhead from sites on the Sacramento River as opposed to the

- CNFH release sites, in terms of sports and commercial fishing opportunity and the utilization of upper Sacramento River restoration investment;
- Issue draft findings and recommendations concerning the advantages and disadvantages of releasing juvenile salmon and steelhead from the alternative sites.

4. Task 2. Evaluate the risks of the production of fall-run chinook salmon at CNFH to the Restoration Project

Coleman National Fish hatchery annually produces about 10 million juvenile fall-run chinook salmon, for release on Battle Creek. About 100,000 of these fish return each year to the hatchery as adults. About 90% of these returning fish die in Battle Creek without spawning, overloading the 3 miles of spawning habitat below the hatchery, and leaving a huge, decaying biomass in the creek.

The hatchery returnees not only disrupt natural spawning below the hatchery by superimposition of redds, but most of these fish carry various pathogens, including IHN and whirling disease, the latter spread through worm hosts which may feed on the salmon carcasses.

The Conservancy and other stakeholders have proposed an alternative connection between the hatchery and the Sacramento River which could potentially minimize any such risks, if analysis shows them to be significant.

The purpose of this task is to assess the risk posed to natural production and the Restoration Project through the presence of the large numbers of fall-run hatchery chinook in Battle Creek, and through the management of the barrier weir which is used to block fall-run chinook, and at limited times the threatened spring-run chinook, from upper Battle Creek. The merits of an alternative management strategy which could minimize any such risks would also be evaluated.

Task 2.1: The impact of superimposed redds on natural production

The large numbers of returning fall-run hatchery chinook are approximately twenty times the number which the habitat in Battle Creek below the hatchery can support, even when the number required for hatchery spawning is removed. These fish generally attempt to spawn in the creek, but such spawning is generally unsuccessful, due to the repeated destruction of redds by other fish trying to use the same space. The purpose of this task is to evaluate the risk to natural production in lower Battle Creek due to redd superimposition (the stacking of spawning redds or re-use of the same areas).

To accomplish this task we propose to perform the following subtasks:

- Consult with U.S. Fish and Wildlife Service and California Department of Fish and Game personnel and others;
- Estimate the extent of the super-imposition of salmon redds in lower Battle Creek and the effect of such super-imposition on the natural production of anadromous fish in the stream;
- Issue draft findings and recommendations concerning the crowding of salmon below the CNFH barrier weir and the impact of the super-imposition of redds on natural production in the lower creek and prospects for salmonid restoration in upper Battle Creek.

Task 2.2: Impact of waste loading of Battle Creek by fall-run carcasses

The large mass (hundreds of tons) of dead fall-run hatchery chinook in lower Battle Creek poses a potential water-quality issue, apart from its impact upon natural production. The purpose of this task is to evaluate the risk the carcass biomass poses to water quality.

To accomplish this task we propose to perform the following subtasks:

- Consult with the California Regional Water Quality Control Board, Central Valley Region, California Department of Fish and Game, and others;
- Estimate the impact on lower Battle Creek water quality caused by the deposition of salmon carcasses downstream of the CNFH barrier weir;
- Evaluate the lower Battle Creek salmon carcass situation in terms of State and federal water quality anti-degradation policies;
- Issue draft findings and recommendations concerning the salmon carcass and water quality situation below the CNFH barrier weir.

Task 2.3: Disease risk to natural salmonid populations due to hatchery production

Most of the returning hatchery adults carry various pathogens, such as IHN (Infectious Hematopoietic Necrosis) virus. The presence of these pathogens in the live fish and in the decaying carcasses may pose a significant threat to anadromous fish using lower Battle Creek, including outmigrating juveniles. The purpose of this task is to evaluate the risk posed by the presence of large numbers of diseased hatchery adults to natural populations in Battle Creek.

To accomplish this task we propose to perform the following subtasks:

- Consult with CNFH and California Department of Fish and Game personnel and others;
- Determine the extent of fish disease transmission among hatchery salmon and between hatchery- and non-hatchery salmon that is likely occurring as a result of the deposition of salmon carcasses and other hatchery-related effluvia in lower Battle Creek;
- Issue draft findings and recommendations concerning disease transmission attributable to carcass deposition and other CNFH production-caused impacts on Battle Creek salmon.

Task 2.4: Evaluation of means to isolate CNFH from Battle Creek

The Conservancy and other stakeholders have suggested that an alternative means to connect CNFH to the Sacramento River be investigated. This alternative uses an existing agricultural ditch, which begins near the hatchery and ends at the river. This ditch has historically had problems with in-migrating salmon, so it is known to be attractive to the fish, and it is large enough to support the 12,000 or so fall-run returns required for hatchery operation. The purpose of this task is to evaluate the potential for this

alternative to function, and to estimate the advantages and disadvantages of such operation.

To accomplish this task we propose to perform the following subtasks:

- Consult with affected land and water owners and others;
- Investigate the costs and benefits of isolating CNFH from lower Battle Creek (and thereby reducing CNFH-attributable risks to the creek's ecology) through, among other things, routing adult salmon returning to the hatchery, and juvenile salmon leaving the hatchery, through the nearby Gover Ranch irrigation ditch (Gover Ditch);
- Identify the engineering features, if any, that would have to be added to the Gover Ditch to support such an isolation strategy, together with preliminary estimates of their costs;
- Identify any water rights issues that might arise from using hatchery effluent, rather than Battle Creek withdrawals, to operate the Gover Ditch for irrigation and CNFH connectivity;
- Investigate the potential for routing CNFH effluent through the California Department of Fish and Game's wetland restoration project, which adjoins the Gover Ditch, as a means of obtaining a higher level of wastewater remediation than either CNFH's present discharge to Battle Creek, or simple re-routing of CNFH effluent via the Gover Ditch directly to the Sacramento River;
- Evaluate the water quality benefits to Battle Creek of such isolation strategies. Identify the adverse impacts, if any, on Sacramento River water quality. Identify the effects such isolation measures might have on the efficacy of juvenile hatchery salmon release strategies: e.g., on imprinting and potential straying. Identify the costs and benefits that such isolation measures would likely have on the collection of surplus fish for rendering;
- Evaluate the hatchery barrier weir requirements at CNFH if an isolation plan were implemented. Identify the costs and benefits of alternative barrier weir configurations;
- Issue draft findings and recommendations concerning the potential isolation of CNFH from Battle Creek through the use of the Gover Ditch; the engineering requirements of such a dual-use ditch; the water quality impacts and benefits of such an isolation scheme, with and without DFG wetlands connectivity; the impact such an alternative hatchery release strategy might have on salmon straying and on spawning in the Sacramento River; and how such an isolation strategy would influence CNFH barrier weir requirements.

5. Task 3. Organize and conduct a workshop to ensure full consideration by both the scientific community and the general public of the findings and recommendations resulting from the proposed project

The Conservancy will organize a one or two-day symposium, most likely in Red Bluff, to enable full and frank discussion of the findings and recommendations arising from the project's analyses. The symposium will follow the formats used by the American Fisheries Society and other professional fish-science organizations. It will be open to all interested parties.

The investigation team's draft work products will be widely circulated to interested parties, including additional independent experts, in advance of the symposium.

The purpose of the symposium is to bring the expertise of the wider fisheries-science community to bear upon the results of the studies funded by this project, and to ensure that the final fish cultural and structural alternatives to be recommended for the Restoration Project represent the best current knowledge.

6. Task 4. Public outreach to ensure that the project efforts and outcomes are brought to the attention of the local community, and that community concerns are effectively brought to the attention of the resource agencies

Many in the local community are skeptical of the Restoration Project, partly on the basis of widely-held suspicions that the Project is at risk due to activities at Coleman National Fish Hatchery. Public acceptance of the Restoration Project is critical to its success, as the local residents will be the de-facto trustees of the anadromous fish in their backyards.

The purpose of this task is to ensure that the local watershed community is fully aware of the results of the science-based risk assessments to be produced by this program, which are focused directly on the issue of local concern, CNFH operations. Public acceptance will come only when the community is convinced that their concerns about the hatchery have been fully and independently assessed, and that any significant issues of risk have been addressed.

The Conservancy, through watershed coordinator Sharon Paquin-Gilmore and consultant Dr. Michael Black, will conduct an outreach effort using the Conservancy newsletter, the region's print and television news media, and public meetings. Dr. Black is the author of "Shasta Salmon Salvage Efforts: Coleman National Fish Hatchery on Battle Creek, 1895-1992."

The outreach effort will include publicity for the symposium (Task 3), to ensure that a significant number of members of the local community participate.

7. Deliverables and schedule

The proposed program will result in the following deliverables being provided to the sponsors, as well as to the agencies and stakeholders involved in the Battle Creek Salmon and Steelhead Restoration Project:

- One interim progress report indicating the progress to date and any changes in the detailed task definitions, issued 120 days into the project.
- Draft scientific reports for each of the subtasks identified in this proposal, issued 60 days prior to the symposium.
- Final scientific reports for each subtask, after draft review by the interested agencies and stakeholders, issued following the symposium.
- An open public symposium for the discussion of the scientific results in the broader fisheries and stakeholder community, convened near the end of the program.
- A refereed proceedings of the symposium, tentatively planned to be issued through the American Fisheries Society.
- Extensive public-outreach materials intended for distribution in the media, at public meetings, and through the Battle Creek Watershed Conservancy newsletter.

It is intended that these deliverables reach the widest possible audience of interested parties and stakeholders, both to make the scientific results generally available, and to facilitate comment on the scientific results by a broad community of interests.

It is proposed that a one-year program is appropriate for the scientific work and the symposium. It is of course to be expected that not all the significant questions addressed by the studies will be resolved in one year, but it is important that the results of the independent studies be available in time to support the Restoration Project, both through the scientific results themselves, and through the improved public support which will accrue from the independent study.

8. PROJECT PERSONNEL

Richard Grost is an independent fisheries scientist who has worked for government and industry clients throughout the Pacific Northwest, including the Klamath River basin in Northern California. He has not worked in the Sacramento River Basin. Mr. Grost, who has an M.S. in zoology and physiology and a B.S. in fisheries biology and management, will manage the technical aspects of the project, will lead data acquisition and scientific analysis of fisheries issues, and assist with outreach and symposium presentations.

Thomas Quinn, Ph.D. is a professor of fisheries at the School of Aquatic and Fisheries Science at the University of Washington. Dr. Quinn will direct analyses of issues concerning fish behavior, genetics, ecology, and competition among and between species.

Fran Borcalli is a Sacramento-based civil engineer who has substantial experience with the analysis of barriers to salmon and steelhead migration and with the design and construction of fish screens and other fish-passage facilities in the Sacramento Valley. He designed and supervised construction of the CalFed project dam removals and modifications on Butte Creek. Mr. Borcalli will provide analysis and recommendations concerning hatchery barrier weir and hatchery water intake alternatives.

Kenneth Ferjancic is a Puget Sound-based fisheries engineer whose firm has worked extensively with agencies and tribes in the development of hatchery facilities. Much of Mr. Ferjancic's recent work has involved the creation of small-scale fish cultural facilities to ensure the conservation of species at risk of extinction. He has worked with Mr. Borcalli in the design and construction of northern California fish facilities. Mr. Ferjancic will provide analysis and recommendations concerning fish hatchery design alternatives.

Daniel Frost is a Redding-based attorney with extensive experience in ranch management and water rights. Mr. Frost's firm has for many years provided legal services to the Gover Ranch on Battle Creek. Mr. Frost will provide analysis of legal issues and remedies concerning Battle Creek water use alternatives.

Sharon Paquin-Gilmore, a Battle Creek landowner and resident long interested in environmental issues, is the Battle Creek Watershed Conservancy's watershed coordinator. Before assuming her BCWC duties, Ms. Paquin-Gilmore taught English at California State University, Chico for 13 years and at Shasta College for four. Ms. Paquin-Gilmore will provide administrative management for the proposed project.

Michael Black, Ph.D. is a San-Francisco-based environmental historian and policy analyst. His history of Coleman National Fish Hatchery is forthcoming in the California Department of Fish and Game's Fish Bulletin, and he is working on a history of salmon on the Sacramento River for the University of California Press. He is a Visiting Associate Professor of Political Science at Harvey Mudd College. Dr. Black will assist the Conservancy Watershed Coordinator in providing public dialog, education, and outreach in the local community.

Additional expertise will be solicited as necessary to enhance the strength and value of specific analyses. Such experts may include fisheries researchers associated with universities and institutions throughout the Northwest.

9. REFERENCES

- Black, Michael. 1998. Shasta Salmon Salvage Efforts: Coleman National Fish Hatchery on Battle Creek, 1895-1992.
- Ward, M. B. and W. M. Kier. 1999a. Battle Creek Salmon and Steelhead Restoration Plan. Prepared for the Battle Creek Working Group by Kier Associates.
- Ward, M. B. and W. M. Kier. 1999b. Maximizing compatibility between Coleman National Fish Hatchery operations and salmon and steelhead restoration in Battle Creek. Prepared for the Battle Creek Working Group by Kier Associates.

10. PROJECT BUDGET SUMMARY

Task	Task subject	Professional services	Direct costs	Indirect costs	Task total
1.1	Impact of the CNFH barrier weir during dry-season production	16000	3000	1900	20900
1.2	Impacts of CNFH water use and intakes on natural production	19000	2800	2180	23980
1.3	Impacts of hatchery steelhead production	9000	2500	1150	12650
1.4	Assessment of the benefits and costs of relocating CNFH dry-season production	24000	3500	2750	30250
1.5	The effects of juvenile release sites on the Sacramento River fishery	4400	2000	640	7040
2.1	The impact of superimposed redds on natural production	5500	2000	750	8250
2.2	Impacts of waste loading of Battle Creek by fall-run carcasses	3100	2500	560	6160
2.3	Disease risk to natural salmonid populations due to hatchery production	7500	2500	1000	11000
2.4	Evaluation of means to isolate CNFH from Battle Creek	36000	3000	3900	42900
3.1	Organize and conduct a workshop to ensure full consideration by both the scientific community and the general public of the findings and recommendations resulting from the proposed project	9500	35000	4450	48950
4.1	Public outreach to ensure that the project efforts and outcomes are brought to the attention of the local community, and that community concerns are effectively brought to the attention of the resource agencies	9200	2500	1170	12870
-	Additional expert opinion as required	9000	5000	1400	15400
-	Project accounting services	2100	250	235	2585
-	Project legal review services	4600	250	485	5335
-	BCWC project coordination	11000	1000	1200	13200
	Subtotals	169900	67800	23770	261470

**Battle Creek Watershed Conservancy Position
on the Restoration Project,
June 11, 2001**



Battle Creek Watershed Conservancy

Post Office Box 606, Manton, California, 96059

June 11, 2001

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Subject: Battle Creek Watershed Conservancy position on the Restoration Program

As you are well aware, the Battle Creek Watershed Conservancy has been energetically attempting to bring local concerns to the attention of the several agencies developing the Battle Creek Salmon and Steelhead Restoration Project for over four years. Now that this Project is moving from the design phase to the implementation phase, we have been forced to realize that our concerns will not be addressed.

For the last three years the Conservancy has repeatedly called for the issues on Battle Creek to be addressed in a systematic way, looking at the entire watershed as a connected system.

The agencies, however, have preferred to concentrate on a program narrowly focused upon the PG&E facilities, telling us that increasing the scope would complicate the project to the point where it might collapse.

The Conservancy and some of the other NGO stakeholders have felt frustrated during this process because all decision-making authority was clearly in the hands of the MOU parties – PG&E and the trustee agencies – and the rules of the “collaborative process” have consistently been used to prevent dialog between the stakeholders and the agencies.

The result of our inability to make significant progress with the agencies has been an increase in local opposition to the Restoration Project, after a long period where opposition had died down while the Conservancy membership felt that the Conservancy was “on top of things.” This increasing frustration culminated in a very well attended Annual Meeting of the Conservancy, where the following resolution was passed overwhelmingly by the membership on May 16th:

A resolution to oppose the Battle Creek Salmon and Steelhead Restoration Project in its current form

The Battle Creek Watershed Conservancy opposes in its present form the Battle Creek Salmon and Steelhead Restoration Project. We believe that potential problems for natural production in Battle Creek due to the operations at Coleman National Fish Hatchery have not been properly taken into account in the planning for the Project, and that there is a substantial probability that the Project will fail as a result. If the project fails the agencies will try all means to save the \$50 million investment, with the likely result that local residents and economic activities will suffer serious restrictions. We take this action reluctantly, as our membership is as concerned for the health of Battle Creek as the agencies, but we would rather see the Restoration Project implemented well, or not at all.

This opposition will continue until the Conservancy Board is satisfied that all possible steps will be taken to protect natural production in Battle Creek, without curtailing hatchery production for the mitigation of the presence of Shasta Dam.

The Board is directed to make the appropriate agencies, including CalFed, aware of its position.

This motion was designed to make the urgency of the situation felt, while still leaving room for a solution.

Obviously it is not enough just to express our frustration. The purpose of this letter is to identify a series of steps which the Conservancy Board feels will adequately ensure that the concerns of our members will eventually be addressed. While there have been many issues important to our constituents, the limited time available clearly shows the need to focus upon the most critical of our concerns, the potential negative effects of the operations at Coleman National Fish Hatchery upon natural production in Battle Creek.

Some of these issues are being belatedly examined in a cursory way in the current CNFH re-evaluation program. We feel that this review is valuable, but quite inadequate considering the complexity of the problems. Let me summarize the key problems which must be addressed to reach a real solution to our problem:

- The Restoration Project design and implementation, including the Adaptive Management Plan, is narrowly focused upon the PG&E facilities. As a result the Project environmental review will not address issues critical to the Conservancy.
- The Project, including the Adaptive Management Plan, is under the control of the MOU agencies and PG&E, with little NGO stakeholder input. While the agencies have politely listened to us for years, in over 100 meetings, they cannot identify any substantive steps taken to address issues of concern to the Conservancy.

- Substantial distrust exists between the Conservancy and the USFWS, to the point where the membership will not trust science coming out of USFWS programs, and USFWS personnel seem to feel that the Conservancy is attempting to put CNFH out of business.
- While many local residents support the idea of the Restoration Project, there is very serious local concern that the Restoration Project could fail due to activities at CNFH. Local opinion associates project failure with inevitable restrictions on land uses, water rights, and economic activities.

To overcome these problems it seems clear to us that the solution must contain the following elements:

- The uncertainties behind the disagreement among the agencies regarding the likely impacts of CNFH upon a restored Battle Creek need to be resolved through an extensive and well planned science program considering Battle Creek and the upper Sacramento River as a complete system.
- The Conservancy and other NGO stakeholders need to play a leading role in this science program, to establish the independence of the work to the satisfaction of the local community, and to help make the community an active part of the Restoration Project.
- Such a science program will take years. A way needs to be found to ensure that the concerns of the community will be addressed in the future, so that the community can withdraw its opposition to the Restoration Project in time to prevent serious delays in the program.
- Pending the resolution of the issues through the science program, major activities at the hatchery which could be affected by the science, such as the barrier weir replacement, should be delayed. The intakes screening project should be limited to screening the present diversions.
- The agencies involved must somehow convince the Conservancy that they are committed to this scientific process, and that any significant problems uncovered will produce appropriate remedial actions by the agencies.

It is the opinion of the Conservancy Board that each of these elements is necessary, and that the five together will be sufficient to allow us to withdraw our opposition.

The following summary describes one possible approach to the problem which meets the requirements just mentioned.

The proposed science program

The science program would study in some depth the issues of competition, genetics, predation, water quality, habitat quality, and pathogens, as affected by the presence of CNFH and as potentially mitigated by various changes in operations – the subjects of a current proposal from the Conservancy to the Packard Foundation.

In addition the program would consider two related issues – the scientific rationale behind CNFH goals (which seem ad hoc to us and are not clear even to the CNFH contractor for the re-evaluation), and the various approaches to re-establishing the anadromous stocks in Battle Creek (it seems strange to us that a \$50 million program is about to be implemented without a trace of a plan for the fish).

Many of these issues involve the upper Sacramento River as well as Battle Creek, so the science program must have a broad perspective.

The science program would include on-the-ground work as well as demonstration projects, so that environmental monitoring could provide data to the scientists, and the scientists in turn could guide monitoring and demonstration efforts.

There would be at least one AFS-sanctioned public symposium during the program, to get the science results out to the scientific community, and to facilitate thorough discussion of the issues. In addition, there would be a significant public outreach program, to bring the results of the program to the general public.

Organization of the program

The task force leading the science program should consist of the NGO stakeholder groups, including the Conservancy (representing local residents, ranchers, timber interests, agricultural interests, and sports fishing interests), the Central Valley Project Water Association (representing agricultural water users), the Pacific Coast Federation of Fishermen's Associations (representing commercial fishing), and The Nature Conservancy (with several local Battle Creek projects).

We suggest that this task force enlist the services of an advisory group to provide advice regarding planning and direction of the science work. This group would include USFWS, NMFS, CDFG, USBR, and possibly DWR and CRWQCB.

The task force would seek review of its activities and advice from the CalFed science panel.

The program would be financed by a combination of public and private funding.

Community buy-in

The science program would take several years. The Conservancy understands the need for urgency in the development of the Restoration Project, so the Conservancy Board is willing to put its faith in science and support the Restoration Project, provided that the science program is under way and the agencies truly support it. We believe that good science will eventually drive reasonable decisions by the agencies in the future. This may not be easy for our constituents to understand, but we see no other way to get reasonable assurance that our concerns will be addressed, without delaying the project for years.

In conclusion, we would like to be able to support the Restoration Project, and we hope that our actions will help make the Project more successful by resolving issues not considered in the initial design. Public support is critical for the success of the Restoration Project, since our local members will be the de-facto trustees of the fish living in our backyards – but this public support cannot be won without a fundamental shift in agency policies, combined with a first-rate, Conservancy-led science program. We are ready to do our part, and invite your cooperation.

Sincerely,

Robert Lee, Secretary
Battle Creek Watershed Conservancy

Four-Agency Letter, September 20, 2001

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825



IN REPLY REFER TO:

September 20, 2001

Mr. Leland Davis, President
Battle Creek Watershed Conservancy
Post Office Box 606
Manton, CA 96059

Dear Mr. Davis:

We would like to propose a problem solving approach to address concerns the local community has voiced through the Battle Creek Conservancy (Conservancy) over some of the activities of government agencies (Agencies) in the Battle Creek watershed. These concerns relate to the Battle Creek Salmon and Steelhead Restoration Project (Restoration Project), that is presently going through the environmental review process, as well as operations of the Coleman National Fish Hatchery (Hatchery), that are now going through consultations under the Endangered Species Act (ESA) and a voluntary reevaluation process. The Conservancy has expressed a vote of opposition to the Restoration Project conditioned on defining a way forward on several issues relating to the future operation of the Hatchery (Conservancy Resolution dated May 16, 2001 described in June 11, 2001 Conservancy letter). The Conservancy concerns are important to the agencies. We have been exploring ways to resolve these issues through a process that will provide meaningful input by all parties including the Conservancy and CALFED. Our collective goal is to restore the salmon and steelhead habitats of the Battle Creek watershed, upstream to its waterfall barriers to maximize naturally reproducing runs, with a priority on the listed species (winter-run chinook, spring-run chinook, and steelhead).

The primary issues as we understand them from your correspondence and subsequent discussions are:

- 1) There are concerns regarding potential impacts of the Hatchery on the anadromous fisheries of Battle Creek, both now and as the Restoration Project is implemented. The need is to ensure the operations of the Hatchery contribute to the recovery of species listed under the ESA in the Sacramento River system. Some of the operations of concern include the Hatchery's water supply and brood stock collection systems.
- 2) The focus of the Adaptive Management Plan for the Restoration Project is narrow and needs to operate at the watershed level using a community-based approach.
- 3) There is a need to provide a long-term way to work with the community at the watershed level such that implementation of the wide array of land and water use decisions in the watershed will address stakeholder input; especially with respect to potential regulatory issues of local concern.

Our analysis of these issues and proposed solution strategies for your consideration are:

Coleman National Fish Hatchery:

- The U S Fish and Wildlife Service (USFWS) in consultation with the National Marine Fisheries Service (NMFS) is bound by the Federal ESA to ensure that federal operations of the Hatchery will not jeopardize the future existence of listed species (winter-run chinook salmon, spring-run chinook salmon, and steelhead). The USFWS has attempted to minimize impacts on listed stocks since 1993 in consultation with the NMFS under the ESA. Under this process, all previous operations have complied with the ESA. A formal consultation is now being conducted on the current operations of the Hatchery under present conditions in Battle Creek. The current Biological Opinion considers existing habitat conditions in Battle Creek that include extremely poor stream flow, high water temperatures, and reduced passage conditions associated with hydroelectric dams above the hatchery. As the Restoration Project improves habitat conditions and thus increases salmonid populations, the USFWS and NMFS will complete further consultations to ensure hatchery operations are consistent with conservation of listed species.
- The USFWS is a resource conservation agency devoted to the restoration of all salmon and steelhead and their habitats in California. The USFWS is striving not only to minimize its impacts on listed species, but to improve their situation through the conservation and restoration of those species in Battle Creek. In working towards the implementation of the Restoration Program and looking forward to having restored habitat conditions in Battle Creek above the hatchery, the USFWS is voluntarily completing a Hatchery Reevaluation, which includes suggestions of the Conservancy. The Agencies support the Conservancy becoming a more active participant in independent scientific review of the Hatchery Reevaluation done in concert with the independent CALFED Science Program. We also recognize that some of the new alternatives being evaluated have a high degree of uncertainty that will require further scientific analysis.
- The USFWS will complete the engineering and environmental evaluations for the Hatchery's water supply and barrier weir facilities using the open processes that have been in place, including all alternatives suggested by the Conservancy. Furthermore, the USFWS commits to not increasing Hatchery water diversions from Battle Creek above the current legal water rights including the water that is required to be passed to non-Hatchery landowners downstream.
- While the environmental process for the permanent water supply project is underway, the USFWS will continue to find ways to minimize diverting juvenile fish into the hatchery. Interim modifications that have been put into place to reduce entrainment include placing a temporary flat plate fish screen at intake 3, installing the flap gate on intake 2 and precluding adult fish to enter the Coleman Powerhouse tail race. In addition juvenile fish are trapped out of the hatchery canal and returned to Battle Creek. Each of the Hatchery intakes have different levels of risk ranging from no risk at the main intake at Coleman Powerhouse, to some risk at the outdated screened intake on the creek, to high but infrequently occurring risk with use of the emergency intake.
- The Coleman barrier weir will be managed and operated to maximize passage for salmon and steelhead populations targeted for restoration in Battle Creek.

Because of its location and purpose, the barrier weir is a useful fishery management tool that may be useful in preventing overcrowding in upstream restored habitats as well as for monitoring fish populations. The environmental process to improve the Coleman Hatchery Barrier Weir is underway and the USFWS will continue to adaptively manage the ladders at the weir to support the Restoration Project. This includes monitoring of the fish populations and keeping hatchery populations from over-crowding the habitat upstream of the weir. In recent years the fish ladder at the weir has been opened more during the summer period based upon monitoring results.

Adaptive Management:

- The Agencies have committed to an Adaptive Management Plan having an open decision-making process with many criteria, including one requiring that community acceptance be considered when making modifications in the PG&E project area. We recognize that the Draft Adaptive Management Plan for the Restoration Project has a narrow focus on the PG&E hydroelectric project. However, this is a necessary constraint due to the dedicated budget for adaptive management of structures and properties licensed under Federal Energy Regulatory Commission.
- The Agencies commit to work with the Conservancy on the development of a broader framework that can coordinate the community-based restoration actions in the watershed with the Restoration Project, and actions at the Coleman Hatchery; especially if, or when, management actions are subjected to adaptive management. The Environmental Document for the Restoration Project being prepared by the Agencies will include our belief that the different projects that are occurring in the watershed have to be closely coordinated to ensure the full success of the restoration project. It would appear that the Battle Creek Working Group and/or the Battle Creek Conservancy are both good candidates for taking on a long-term role in coordinating the various activities in the watershed. We support Stakeholder leadership and involvement in this broader forum, with the understanding that the Federal and state agencies cannot abrogate their statutory decision making authorities and responsibilities.

Community-based Implementation:

- We are currently seeking to hire a coordinator to the assist the Agencies and the Conservancy in working together to develop a broader science and community-based framework for completing projects throughout the watershed, not just the Restoration Project area. The Agencies and the Conservancy share the goals for restoring Battle Creek as expressed in our respective strategy documents (The Conservancy's "Battle Creek Watershed Community Strategy" dated March 1999 and the Agencies efforts beginning with "Sacramento River Fisheries and Habitat Management Plan" dated 1989, "Final Restoration Plan for the Anadromous Fish Restoration Program" dated January 23, 2001", USFWS's April 3, 1998 position paper on Battle Creek watershed and in the CALFED Watershed and Ecosystem Restoration Programs Record of Decision - August 2000).
- We continue to support the Conservancy's leadership role on land and water management issues in the watershed outside of the PG&E Hydroelectric Project license amendment process. Currently the Conservancy has the lead in addressing watershed issues through the CALFED/CVPIA grant process.

- We invite the Conservancy to pursue their interests in examining Battle Creek fishery management issues within the regional context of the Upper Sacramento River basin. We suggest the use of the CALFED Watershed and Ecosystem Restoration Program in association with the CALFED Science Program for this regional approach. The goals of these programs are to provide financial and technical assistance for watershed activities that help achieve fisheries restoration goals, and to promote collaboration and integration among existing and future local watershed programs.
- We would like to work with the local landowners on evaluating the risk they believe exist if the Restoration Project fails to meet its long-term objective of maintaining viable populations of anadromous fish in the creek. We understand the local landowners believe that in the event of such a failure they may somehow be made to assume the burden to restore the fish through restrictions on land uses, water rights and/or other economic activities. The objective of the Restoration Project is based on using the bed and banks of Battle Creek in their existing condition and providing needed water and passage through modification of the PG&E project. We believe that the current land use practices and activities within the Battle Creek watershed have maintained the bed and bank of the creek in good condition, especially considering the type of low flow conditions in the creek, due to the hydroelectric project. In terms of water use for the project, we have determined that over the past decades PG&E and their predecessors have collected all the water rights needed for reallocation to the Restoration Project, thus providing the basis for the MOU with PG&E.
- We support measures to assist landowners to continue their current land uses, such as conservation easements consistent with the "Battle Creek Watershed Community Strategy". Because we cannot predict the future, we must recognize the possibility that major changes in land use practices may occur that are not compatible with laws on keeping the water clean or the bed and bank of the stream in adequate condition. The public entrusts the resource Agencies to monitor the fish and wildlife resources, properly review proposals for new projects under environmental decision making processes, recommend mitigation, and conserve habitat and salmon and steelhead. We will follow our conservation mandates, while at the same time working cooperatively with all parties, including the local landowners, to conserve these resources.
- The agencies feel strongly that the Restoration Project move forward on schedule. We believe that we can implement the Restoration Project using the established environmental decision making processes that are based upon providing full disclosure and addressing the concerns of the stakeholders and the public. We intend to address the main issues of concern that the Conservancy has expressed within the environmental document, since they are related to the Restoration Project. However, it is not practical to wait for all the related projects to be fully developed prior to implementing the Restoration Project. For instance, many of the Coleman Hatchery issues and future decisions may depend upon the full effects of the Restoration Project and the expected recovery of the listed species above the Hatchery.

We would like to meet with the Conservancy to further clarify the main issues of concern so together we can develop a framework that will scientifically address all the details within a community-based decision making process. Through this effort we can set a time line for resolution of the issues. As we go down this path, the agencies will improve the effectiveness of our efforts to involve the public and disseminate information. Perhaps the best forum to accomplish this is through the Battle Creek Working Group. We appreciate your good

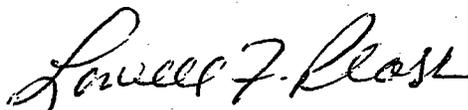
stewardship and interest in conservation and restoration of the salmon and steelhead fisheries of the upper Sacramento River and Battle Creek.

If you have any questions regarding this information or the goals of the restoration program please contact any of the following signatories to this letter.

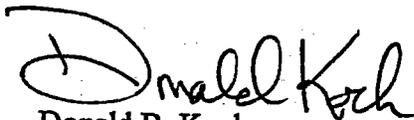
Sincerely,



Wayne S. White
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**Draft Greater Battle Creek Working Group
Memorandum of Understanding,
August 8, 2002**

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GREATER BATTLE CREEK WATERSHED WORKING GROUP

MEMORANDUM OF UNDERSTANDING

VISION

The signatories of this Memorandum of Understanding (MOU) recognize the value of coordinating the planning, implementation, and evaluation of all fisheries, restoration and watershed projects among public agencies, nonprofit organizations and private landowners within the Greater Battle Creek Watershed in order to maximize restoration of all naturally produced anadromous fish and maintain, and restore, as necessary, a healthy watershed and landscape. They seek to create a Greater Battle Creek Watershed Working Group (GBCWWG or Working Group) that:

- Identifies proactive approaches to resource management on an ecosystem basis using principles of adaptive management;
- Utilizes sound scientific information and full consideration of public input in order to maintain and restore a healthy watershed and landscape that provides for robust, sustainable populations of naturally produced anadromous fish, including steelhead, fall-run, late fall-run, spring-run and winter-run chinook salmon;
- Recognizes the federal mandates and commitments to: 1) restore naturally produced salmon and steelhead in the Battle Creek Watershed, 2) mitigate for anadromous fish habitat lost above Shasta Dam, 3) rebuild depleted anadromous fish populations and 4) maximize the compatibility of the Coleman National Fish Hatchery (CNFH) and the Livingston Stone National Fish Hatchery (LSNFH) with other watershed projects including the Battle Creek Restoration Project;
- Commits to extensive communication and education programs;
- Considers local economic and societal impacts of proposed actions; and
- Supports traditional land uses that contributes to the maintenance and enhancement of the watershed and its native species.

PURPOSE

The purpose of this MOU is to create a forum for identifying, reviewing and coordinating various watershed activities in the Greater Battle Creek Watershed and evaluating the activities' consistency with a Greater Battle Creek Watershed strategy. The signatories seek to encourage projects that are consistent with a community- and science-based greater watershed strategy and that (1) incorporate the principles of adaptive management to be adopted by the Working Group and (2) establish programmatic linkages between the major actions in the watershed, on the stream course and with CNFH and LSNFH. Working Group members will provide advice and recommendations on plans or projects reviewed by the Working Group on behalf of the MOU signatory represented by the member, including public agencies and nonprofit organizations. Signatories also seek to advance the Multi-Species Conservation Strategy; Central Valley Project Improvement Act (CVPIA) doubling goals of naturally produced salmonids pursuant to the Anadromous Fish Restoration Project (AFRP); Federal Energy Regulatory Commission (FERC) policy regarding hydroelectric project compatibility with comprehensive plans; CALFED ecosystem restoration goals to restore and enhance habitat, ecosystem functions and processes; and Battle Creek Watershed Conservancy (BCWC) community strategy goals. The goals and objectives of these programs are summarized in Appendix A, attached and incorporated herein by this reference.

For the purposes of this document, **Greater Battle Creek Watershed** means the entire Battle Creek watershed from its confluence with the Sacramento River to its headwaters and its major tributaries

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and associated riparian and upland areas as well as the upper Sacramento River to the extent that the LSNFH is connected to the Battle Creek hatchery program.

OBJECTIVES

- Establish a transparent, balanced, collaborative, respectful and inclusive forum for communication that ensures activities within the watershed are synchronized, and that goals, objectives and evaluative processes of agencies and organizations are coordinated.
- Take necessary steps to develop a comprehensive greater watershed strategy to ensure that fisheries, habitat restoration or watershed projects support and make important contributions to the recovery of, and has no long term adverse effect on, listed species (winter-run and spring-run chinook salmon and steelhead), the restoration of non-listed naturally produced runs (fall-run and late fall-run chinook salmon), production of chinook salmon for sport and commercial uses, production of steelhead for in-river sport uses as well as continued health of the riparian and upland habitat.
- Identify specific needs for new projects based on the comprehensive greater watershed strategy and current or planned activities within the watershed.
- Adopt and apply principles of science and, as appropriate, adaptive management processes to actions considered and undertaken in the comprehensive greater watershed strategy.
- Engage agencies, organizations and the public to provide information on the comprehensive greater watershed strategy and adaptive management processes, identify and communicate issues and proposed projects, and maximize compatibility of activities of the CNFH, LSNFH, the Battle Creek Restoration Project and other agencies, private industries and nonprofit organizations operating within the Greater Battle Creek Watershed.
- Establish and implement a review process for fisheries, restoration and watershed projects undertaken within the Greater Battle Creek Watershed that may result in endorsement by members of the Working Group.
- Define and develop administrative processes to guide the Working Group in accomplishing its objectives effectively and efficiently.
- Review and propose communication and education programs for the Battle Creek community.

ORGANIZATIONAL STRUCTURE

1. **General.** The Working Group meetings are open to participation by the general public, and by any agency, organization or individual involved in the Greater Battle Creek Watershed. All Greater Battle Creek Watershed Working Group meeting notices will be made available to the general public and the meeting agendas will include a time for the general public to provide comment on issues before the Working Group for consideration or that relate directly to the purposes of the Working Group.
2. **Greater Battle Creek Watershed Working Group Membership.** To accomplish the objectives of this MOU, there will initially be no more than 16 signatory members of the Greater Battle Creek

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Watershed Working Group to be comprised of no more than 8 public agencies and no more than 8 non-public entities, all of whom shall be signatories to the MOU. Initial signatories include:

Non-Public Entities:

Battle Creek Watershed Conservancy
Pacific Gas and Electric Company
The Nature Conservancy
Central Valley Project Water Association
Pacific Coast Federation of
Fishermen Association
Nor-Cal Fishing Guides and
Sportsmen's Association
Friends of the River

Public Agencies:

U.S. Fish & Wildlife Service
CA Department of Fish and Game
U.S. Bureau of Reclamation
National Marine Fisheries Service
CA Department of Water Resources

U.S. Bureau of Land Management

The initial signatories shall each appoint one primary representative and at least one alternate to the Working Group. An entity or public agency wishing to become a signatory member of the Working Group subsequent to the Working Group's initial formation shall submit a letter of commitment to the Working Group that describes the organization's commitment to ongoing involvement in the Working Group and discusses the organization's consistent and significant involvement and knowledge of Battle Creek issues and of the Working Group in the previous four consecutive meetings. If attendance records show consistent attendance and involvement for the previous four consecutive meetings and upon submission of the letter, the entity or agency may become a provisional member of the Working Group for the ensuing four consecutive meetings. If the provisional member regularly attends meetings and is consistently involved in the Working Group for the four meeting period, the provisional member may become a signatory member. Because the Working Group signatory members strive to achieve balance between the public agency and non-public entity representation, at no time shall the number of public agency signatory members or the number of non-public entity signatory members total more than one additional member than the other group.

Signatory members are expected to regularly attend meetings of the Working Group. The signatory members shall annually review attendance and if a signatory member has missed meetings for four consecutive meetings, the signatory member shall become a provisional member and is subject to the provisional membership provisions described above. A signatory member may withdraw as a member of the Working Group at any time, and for any reason, by submitting a written letter to the Working Group expressing the desire to no longer be a member. A withdrawing signatory member shall incur no liability to the Working Group or its other signatory members as a result of such withdrawal. If such a withdrawal creates an imbalance between the number of public agency and non-public entity members, the Working Group shall seek another signatory member to rebalance the membership, or if no additional signatory member is available, the Working Group shall maintain the imbalance until another signatory member is available to reestablish the balance.

No later than twenty (20) working days after the final execution of this MOU, each initial signatory shall notify the other signatories of the names, addresses, email addresses, telephone numbers and facsimile numbers of that signatory's primary and alternate representative. Signatories shall notify the other signatories of any changes in their representatives.

At the first meeting of the Working Group, signatory members shall nominate and elect a chairperson, vice chairperson and secretary for a one year term. Future communications regarding Working Group meetings shall be addressed to the primary and alternate representatives, as well as through the public notice described above. The signatory members will determine how information will be disseminated

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in the future. For the chairperson or the vice chairperson positions, one shall be from a non-public entity and one shall be from a public agency which is not a federal agency. The Working Group shall hold an annual meeting. Additional meetings may occur, as the Working Group deems necessary.

The signatory members of the Working Group may revise, as necessary, the vision, purpose, objectives and organizational structure for the Greater Battle Creek Watershed. In addition, the signatory members shall:

- a. Provide a forum for discussing current and proposed projects that impact the Greater Battle Creek Watershed.
- b. Identify linkages for current and proposed fisheries and restoration actions and ensure that current and proposed actions appropriately coordinate activities with agencies and organizations based on the linkages.
- c. Review and comment on current and proposed actions by signatory members regarding their consistency with the greater watershed strategy.
- d. Review and comment on conceptual models, hypotheses, and adaptive management experiments for proposed actions based on the greater watershed strategy and sound scientific principles.
- e. Review and evaluate indicators and measures of success regarding program performance for implemented actions in regard to the greater watershed strategy.
- f. Develop proactive responses to address regulatory requirements.
- g. Determine how best to accomplish the administrative activities of the Working Group.

3. **Project Review.** The signatories to this MOU agree that the Working Group will review and discuss Battle Creek projects of signatory members for consistency with the greater watershed strategy prior to a signatory member submitting a project proposal for public funding to any federal, state or local government agency. The Working Group shall prepare a written statement providing a synopsis of all comments on the project by the signatory members. If a majority of the comments are in favor of the project, then it shall be considered an endorsement of the project; if a majority of the comments are opposed, it shall be considered a non-endorsement. Comments from provisional members or members of the public shall be summarized in the statement. No comment by the members of the Working Group can require any signatory to violate any laws, license agreements or adopted agency policies and procedures. The signatory recommending a project for review by the Working Group agrees to provide a copy of the Working Group's written statement along with any proposal it submits for public funding from a federal, state or local government agency.

4. **Committees.** The Working Group may establish such committees as are necessary to assist in fulfilling the objectives of this MOU.

OPERATING PRINCIPLES

1. Members of the Working Group shall respect the viewpoints of others, and expect that their viewpoints will be respectfully heard and considered. They understand that they each are responsible for maintaining an atmosphere where ideas and positions can be freely exchanged and discussed. They refrain from personal attacks on others, avoid hidden agendas, and conduct themselves in a manner that fosters group building.
2. This MOU is a dynamic document; it may, through a written document, be amended, repealed or altered by a unanimous decision of all the signatory members attending any duly organized Working Group meeting provided that notice of the proposed change(s) is included in the meeting notice and agenda prior to the meeting.

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3. Nothing in this MOU may be the basis of any third party challenges or appeals. Nothing in this MOU may be the basis of any legal challenges, causes of actions or appeals.
4. Nothing in this MOU is intended to expand or limit the legal authority or obligation of any signatory, agency, entity or organization.
5. In establishing meeting schedules, the Working Group shall try to accommodate all members' schedules.

FUNDING

1. Each signatory of this MOU and any participant of the Working Group is responsible for costs associated with their participation in meetings resulting from this MOU. This provision shall not preclude any signatory or participant from obtaining funding from sources outside their agency or group for the purposes of the Working Group nor getting funded directly from Working Group members, if appropriate.
2. Participation in the Working Group and performance of activities by any participant of the Working Group is subject to customary appropriation or allotment of funds. No liability shall accrue to the participant, his/her agency, or the United States in the event funds are not appropriated or allotted.

DRAFT APPENDIX A

REFERENCES

Introduction

This appendix is meant to present the goals and objective statements of some of the public agencies, non-government organizations and other interested entities engaged in planning and implementing federally and state mandated restoration programs and community based conservation programs in the Greater Battle Creek Watershed which are likely to advance natural fish and wildlife populations, habitat health, and ecosystem functions while at the same time acknowledging resource and economic constraints.

The Battle Creek Watershed Conservancy Community Strategy goal is to preserve the environmental and economic resources of the Battle Creek watershed through responsible stewardship, liaison, cooperation and education.

CALFED ecosystem restoration goals for the North Sacramento Valley are to restore important fishery, wildlife and plant communities to a healthy condition. Comprehensive watershed management plans should be developed and implemented to restore important ecological processes that create and maintain habitats for fish, wildlife and plant communities. For Battle Creek specifically, objectives are to develop and implement a comprehensive watershed management plan, increase flows, improve the water supply to Coleman National Fish Hatchery, remove diversion dams or install new ladders, and install positive-barrier fish screens to protect juvenile Chinook salmon and steelhead. It is envisioned that Battle Creek will provide much-needed habitat for spring-run and winter-run Chinook and steelhead, in addition to maintaining its existing importance to fall- and late-fall Chinook.

CVPIA's Anadromous Fish Restoration Program (AFRP) is a set of actions developed by USFWS and USBR to help guide the Department of Interior to make all reasonable efforts to at least double the natural production of anadromous fish in Central Valley streams and rivers on a sustainable long term basis. CVPIA Central Valley doubling goals are based on population averages for the baseline time period 1967-1991 for fall-run, late fall-run, winter-run, and spring-run chinook salmon and steelhead. Production targets for Battle Creek and its tributaries are not available for all the runs because population estimates did not exist for 1967-1991 for each run. However fish population increase estimates were made in the AFRP Working Paper (USFWS 1995, adopted 2001). These estimates are based on the amount of potential spawning substrate in river reaches where salmon and steelhead spawn in the Battle Creek watershed. The anadromous fish population increase estimates are as follows: 4,500 for fall-run, 4,500 for late fall-run, 2,500 for winter-run, 2,500 for spring-run chinook salmon and 5,700 for steelhead.

The Multi-Species Conservation Strategy (MSCS) for the CALFED Bay-Delta Program is an approach that entities implementing CALFED actions may use to fulfill the requirements of the federal Endangered Species Act, California Endangered Species Act and Natural Community Conservation Planning Act. The MSCS analyzes CALFED's effects on species and communities, identifies species and community goals and conservation measures to achieve the goals. The measures are incorporated into the CALFED Ecosystem Restoration Program Plan.

FERC policy in section 10 of the Federal Power Act concerns hydroelectric project compatibility with comprehensive plans. Licenses issued pursuant to section 10 require projects be part of a comprehensive plan, some of the conditions of which include providing for the adequate protection,

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mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat) and for other beneficial public uses.

For the purpose of this MOU, the signatories consider naturally produced fish or natural fish to be the offspring of naturally spawning parents.

**DRAFT
SIGNATURES**

National Marine Fisheries Service Date _____

**Correspondence from Battle Creek Watershed
Conservancy to CALFED, October 25, 2002**

October 25, 2002

Mr. Patrick Wright
Director, CALFED Bay-Delta Program
1416 Ninth Street, Suite 1155
Sacramento, CA 95814

Dear Mr. Wright,

On behalf of the Battle Creek Watershed Conservancy Board, I am pleased to report that significant progress is being made to resolve local concerns regarding the Battle Creek Salmon and Steelhead Restoration Project (Restoration Project). We understand that one of the factors cited by CALFED for not approving additional funding for the Restoration Project has been lack of local support. The purpose of this letter is to provide an update on this issue and to outline issues that need to be addressed to facilitate local support for the Restoration Project as we move forward.

Background

As you know, at the 2001 Annual Meeting of the Battle Creek Watershed Conservancy, the membership voted to oppose the Restoration Project "in its present form." The resolution also stated that opposition would continue until the Conservancy Board was satisfied that "all possible steps will be taken to protect natural production in Battle Creek, without curtailing hatchery production for the mitigation of the presence of Shasta Dam." One of the Conservancy's main concerns has been that Coleman National Fish Hatchery (CNFH) operations could jeopardize natural production of Battle Creek salmon populations once the Restoration Project is implemented. Although the Board still has reservations and concerns regarding some of the issues it has expressed to the Battle Creek Working Group and CALFED regarding CNFH operations and its impact on the success of the Restoration Project, the Board is actively seeking ways to move forward that will maintain local support.

Gaining Local Support for the Restoration Project

We have seen substantial progress in resolving issues with the formation of the Greater Battle Creek Working Group and the signing of the MOU. Additionally, the participation of the CALFED Science Program in setting up a science symposium on lower Battle Creek will help to resolve many of the issues connected to the success of the Restoration Project. We look forward to establishing a base of independent science which can be used to help evaluate future actions on Battle Creek.

Since no member of our group has the scientific expertise or credentials to participate in the science process, we need to find funding to continue the services of Mike Ward of Terraqua. As you may know, Mike played a key role in developing technical recommendations that were developed to support the negotiations for the Restoration Project. He is well respected both in the local community and with the signatories of the Restoration Project MOU. We anticipate the cost of these services to be \$60,000 a year for five years. Twenty percent of the funding would go to overhead and administrative support, and eighty percent would be used for Mike's time and expenses. The five year funding would allow Mike to participate, on behalf of the Conservancy, through the construction phase of the Restoration Project, the next CNFH Biological Assessment, and, hopefully, into the adaptive management phase of the Restoration Project. Looking at the economic picture, \$300,000 over five years is a very small percentage of money that will be spent on Battle Creek, but it will assure that the local residents are part of the process.

The one remaining issue of concern to the BCWC Board is the exposure of Mount Lassen Trout Farms (MLTF) to contamination of three of its facilities by the Restoration Project. The construction of the ozone system at CNFH, and the evaluation of Bill Cox, a disease pathologist with California Department of Fish and Game, indicate that there is significant risk.

MLTF is one of the largest primary sector employers in the watershed. Several large ranches in the area rely on the cash flow provided by MLTF leases to stay economically viable when cattle ranching won't support them. The loss of this revenue could cause environmental problems in the watershed if those creek front ranches are sold or divided.

We understand that there is insufficient time to resolve the exposure problem at the threatened MLTF hatchery facilities, but if the environmental documents contain full disclosure of the problem, along with a commitment to solve the problem in a timely manner, we can move forward.

Given the progress made, if the BCWC Board of Directors can see a timeline and a format for the science symposium, a source of funding to hire a technical advisor, and an environmental recognition and commitment to solve the Mount Lassen exposure problem, we will issue a provisional approval of the Restoration Project pending a meeting of the membership. We would fully expect the membership to concur with our decision.

Thank you for your consideration.

Sincerely,

Larry Lucas
Secretary, BCWC Board

Appendix D

**Draft Battle Creek Salmon and Steelhead
Restoration Project Adaptive Management Plan**

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BATTLE CREEK SALMON AND
STEELHEAD RESTORATION PROJECT
ADAPTIVE MANAGEMENT PLAN

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

September 2001

DRAFT
BATTLE CREEK SALMON AND
STEELHEAD RESTORATION PROJECT
ADAPTIVE MANAGEMENT PLAN

Prepared for the

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

Prepared by

Kier Associates
Sausalito, California

September 2001

This version incorporates all comments received through September 5, 2001.

PREFACE

Battle Creek has historically been regarded as a uniquely important salmon-producing watershed because of the large numbers and broad diversity of chinook salmon and steelhead that have historically used this stream. The importance of restoring the fish habitat and populations within Battle Creek has long been recognized, but the urgency of the ongoing Battle Creek Salmon and Steelhead Restoration Project (Restoration Project) is heightened by the fact that this watershed is home to winter-run chinook salmon, spring-run chinook salmon, and steelhead, all of which are in danger of or threatened with extinction as defined by the federal Endangered Species Act (ESA). Furthermore, Battle Creek provides the only remaining accessible habitat in the Sacramento River watershed, other than the Sacramento River itself, that may be suitable for populations of winter-run chinook salmon.

The primary goal of the Restoration Project is to restore and enhance about 42 miles of anadromous fish habitat in Battle Creek and an additional 6 miles of habitat in its tributaries while minimizing the loss of renewable energy produced by the Battle Creek Hydroelectric Project. The Restoration Project has been the result of a long planning process that culminated in a Memorandum of Understanding (MOU) between the Resource Agencies and Pacific Gas and Electric Company (PG&E). An integral part of the MOU was the direction to develop and implement an adaptive management program to monitor the effectiveness of restoration actions taken and make further adjustments to Hydroelectric Project facilities and/or operations as appropriate in pursuit of the primary goal of the Restoration Project.

Therefore, this document is the strategic plan agreed upon by the Resource Agencies and PG&E. Its goal is to implement specific actions to protect, restore, enhance, and monitor salmonid habitat at the Hydroelectric Project to guard against false attraction of chinook salmon and steelhead, and to ensure that these fish in all life stages are able to fully access and beneficially use available habitat, thereby maximizing natural production and the full use of ecosystem carrying capacity. While this Adaptive Management Plan (AMP) was written primarily to conform to provisions of the MOU, it is also recognized that this AMP may assist the Federal Energy Regulatory Commission (FERC) regulating license compliance and may be incorporated as part of, or at least linked to, other Battle Creek watershed and statewide resource management efforts. Because this plan is intended specifically to apply to the Restoration Project and is not a general watershed management plan, its objectives and protocols must be evaluated in light of these stated purposes.

At the core of this plan (Section III) are 11 objectives incorporating scientific information gathering with adaptive management decision making, all within the context of federal and state policy and MOU provisions. These objectives are framed by a discussion (Section II) of the organization of the adaptive management program including management structure, roles, responsibilities, and funding mechanisms. Section IV describes how this adaptive management program will link to other resource management efforts. Protocols for implementing this plan are discussed in Section V. Finally, the Executive Summary gives the reader an abridged, but comprehensive overview of all elements of this plan.

NOTES TO THE READER

This AMP assigns specific meanings and definitions to some common words or proper nouns. Words used in the text that represent specific meanings as defined within this plan are indicated by capitalizing the first letter of each word. Definitions for these words can be found beginning on page 17.

Table 1. A list of acronyms used within this report.

AFRP	Anadromous Fish Restoration Program
AMF	Adaptive Management Fund
AMP	Adaptive Management Plan
AMPT	Adaptive Management Policy Team
AMTT	Adaptive Management Technical Team
BA	Biological assessment
BCWC	Battle Creek Watershed Conservancy
BCWG	Battle Creek Working Group
BLM	United States Bureau of Land Management
CALFED	CALFED Bay-Delta Program
CAMP	Comprehensive Assessment and Monitoring Program
CDFG	California Department of Fish and Game
CDWR	California Department of Water Resources
CED	California Energy Commission
CEQA	California Environmental Quality Act
CMARP	Comprehensive Monitoring, Assessment, and Research Program
CNFH	Coleman National Fish Hatchery
CRR	Cohort replacement rate
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
EPA	Environmental Protection Agency
ERP	Ecosystem Restoration Program
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
GPS	Global positioning system
IFIM	Instream flow incremental methodology
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
PG&E	Pacific Gas and Electric Company
POC	Point of Contact
Restoration Plan	Battle Creek Salmon and Steelhead Restoration Plan
Restoration Project	Battle Creek Salmon and Steelhead Restoration Project
TNC	The Nature Conservancy
USBR	United States Bureau of Reclamation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WAF	Water Acquisition Fund

EXECUTIVE SUMMARY

The Restoration Project is a joint effort between PG&E, the National Marine Fisheries Service (NMFS), California Department of Fish and Game (CDFG), U.S. Fish and Wildlife Service (USFWS), and U.S. Bureau of Reclamation (USBR) to restore salmon and steelhead runs in the Battle Creek watershed while maintaining the renewable energy production of the Battle Creek Hydroelectric Project (FERC Project No. 1121). An MOU was adopted in June 1999 stating the intent of the MOU parties to engage in a restoration effort that would modify the facilities and operations of FERC Project No. 1121. The objectives of the Restoration Project are (1) the restoration of self-sustaining populations of chinook salmon and steelhead and their habitat in the Battle Creek watershed, (2) up-front certainty regarding specific restoration components, (3) timely implementation and completion of restoration activities, and (4) joint development and implementation of a long-term AMP with dedicated funding sources to ensure the continued success of restoration efforts under this partnership.

The MOU identifies Adaptive Management as an important component of the Restoration Project (Figure 1). Adaptive Management uses extensive monitoring to identify problems, examine possible solutions for meeting the biological objectives, and if needed, allow changes to Contemporary strategies and actions within established limits to try to achieve the objectives and desired results. The Adaptive Management concept was formalized in this AMP developed by the PG&E, NMFS, USFWS, and CDFG (collectively known herein as the “Parties”). Funding for implementation of the AMP is provided by the CALFED Monitoring Fund, the Water Acquisition Fund (WAF), the Adaptive Management Fund (AMF), and Licensee (Pacific Gas and Electric Company).

The AMP describes policy regarding the management of Restoration Project-related fish populations, habitat, and passage when the MOU does not specifically address a policy issue. However, in cases where the language in the AMP may conflict with the MOU, policy regarding these topics will be set by the MOU. The MOU prevails in any discrepancy between policy specified in the AMP and that set by the MOU.

The AMP was developed by Consensus between the Parties under the Adaptive Management Policy Team (AMPT) and the Adaptive Management Technical Team (AMTT). The AMPT consists of management-level representation from each of the Resource Agencies and the Licensee and is authorized to make all final decisions regarding the implementation of the AMP and to provide policy direction and dispute resolution on issues forwarded to it by the AMTT. The AMTT consists of technical experts from each of the Resource Agencies and the Licensee and is responsible for the development and implementation of the AMP portion of the Restoration Project when it has been approved by FERC. Definitions are provided in the AMP to minimize confusion and to simplify the text. Words or phrases defined in the AMP appear capitalized within this plan.

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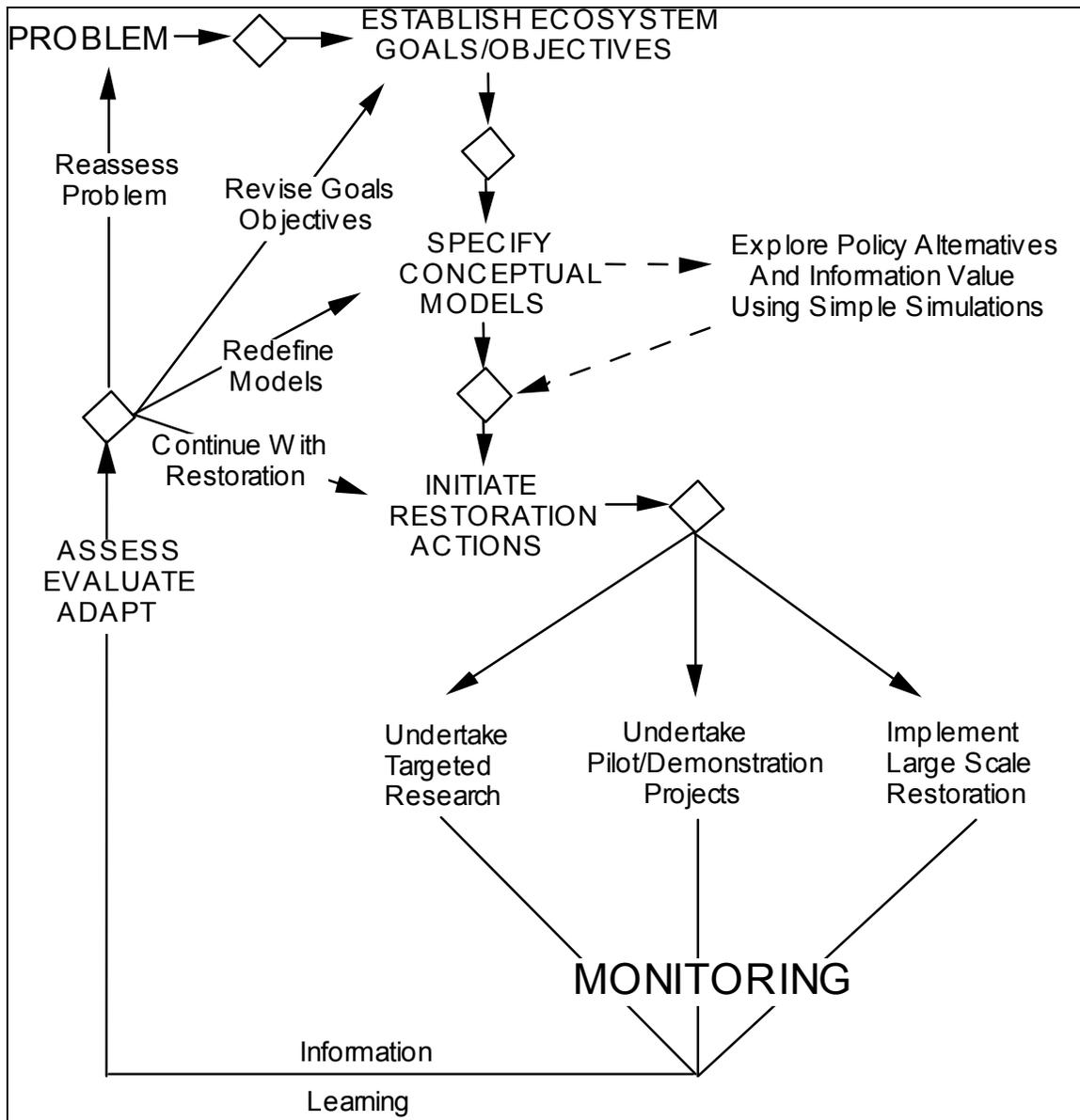


Figure 1 CALFED schematic of adaptive management.

Roles and responsibilities of the Parties pertaining to the AMP portion of the Restoration Project are listed in detail. The Licensee has agreed to a number of physical and operational changes and additions to FERC Project No. 1121 and has agreed to assume 90 percent of the initially forecast costs associated with the loss of power generation as well as other future costs. These include, but are not limited to, cost overruns for which the Licensee is responsible, future authorized facilities modifications or increased instream flows in the event the WAF and AMF are depleted, internal costs associated with providing expertise in the AMP process, and the loss of power associated with meeting instream flow releases and Ramping Rate requirements. Upon completion of facility start-up and testing, Licensee is responsible for the operation, maintenance, replacement, and successful operation of all physical modifications to its facilities under

the MOU. Licensee is also responsible for all facility and other monitoring required by the FERC license amendment for FERC Project No. 1121. NMFS responsibilities are those it determines consistent with its mandate under the ESA. NMFS also has the responsibility of defining recovery goals for salmon species listed under the ESA. Together the USFWS and CDFG agree to support the prescribed instream flows and Ramping Rates described in the MOU, or agreed upon through the Adaptive Management in the next relicensing proceeding for FERC Project No. 1121. USFWS and CDFG are also jointly responsible for conducting or funding a variety of monitoring, data collection and assessment, and report preparations associated with various fish population objectives. In addition, all Parties will be responsible for providing at least one representative to the AMPT and the AMTT and assuming all responsibilities and costs associated with these positions. All Parties will be individually responsible for any costs associated with their involvement in any FERC dispute resolution proceedings.

Sources of funding for the implementation of the AMP identified to date are the CALFED Monitoring Fund, the WAF, the AMF, and the Licensee. The CALFED Monitoring Fund of \$1,000,000 is intended for monitoring costs associated with the Restoration Project. The WAF is a federal fund of \$3,000,000 administered by the Resource Agencies per AMP protocols and intended for the sole purpose of acquiring additional instream flow releases in Battle Creek recommended under the AMP for a ten year period following the initial prescribed instream flow releases. The AMF of \$3,000,000 is for the purpose of funding possible future changes to the Restoration Project developed under the AMP. The AMF is to be limited to actions under the Restoration Project directly associated with FERC Project No. 1121, and is expressly not available for funding of monitoring or construction cost overruns. In the event of the exhaustion or termination of the WAF, the AMF may be used to secure additional instream flow releases developed under the AMP. In the event of exhaustion of the WAF and AMF, the Licensee has committed up to a total of \$6,000,000 for all Adaptive Management actions for Authorized Modifications to project facilities and/or flow operations which are determined to be necessary under Adaptive Management.

The Adaptive Management objectives outlined in the AMP focus on management of hydroelectric operations within the Restoration Project to facilitate habitat changes beneficial to salmon and steelhead. There is expected to be a corresponding increase in salmon and steelhead populations as a result of these management actions. Measuring such increases is practical for larger populations such as steelhead and fall-run chinook salmon, but proving statistically significant responses to fish populations currently at extremely low levels, such as winter-run chinook, may not be possible. Therefore, trigger events leading to Adaptive Management actions will not be based solely on populations data, but will also rely on measurements indicating habitat conditions. The AMP objectives do not include or exclude existing or potential future propagation and/or supplementation activities, nor do they consider “active” experimentation to elucidate relationships between management actions and ecological processes, nor do they address the possibility of future development within Battle Creek.

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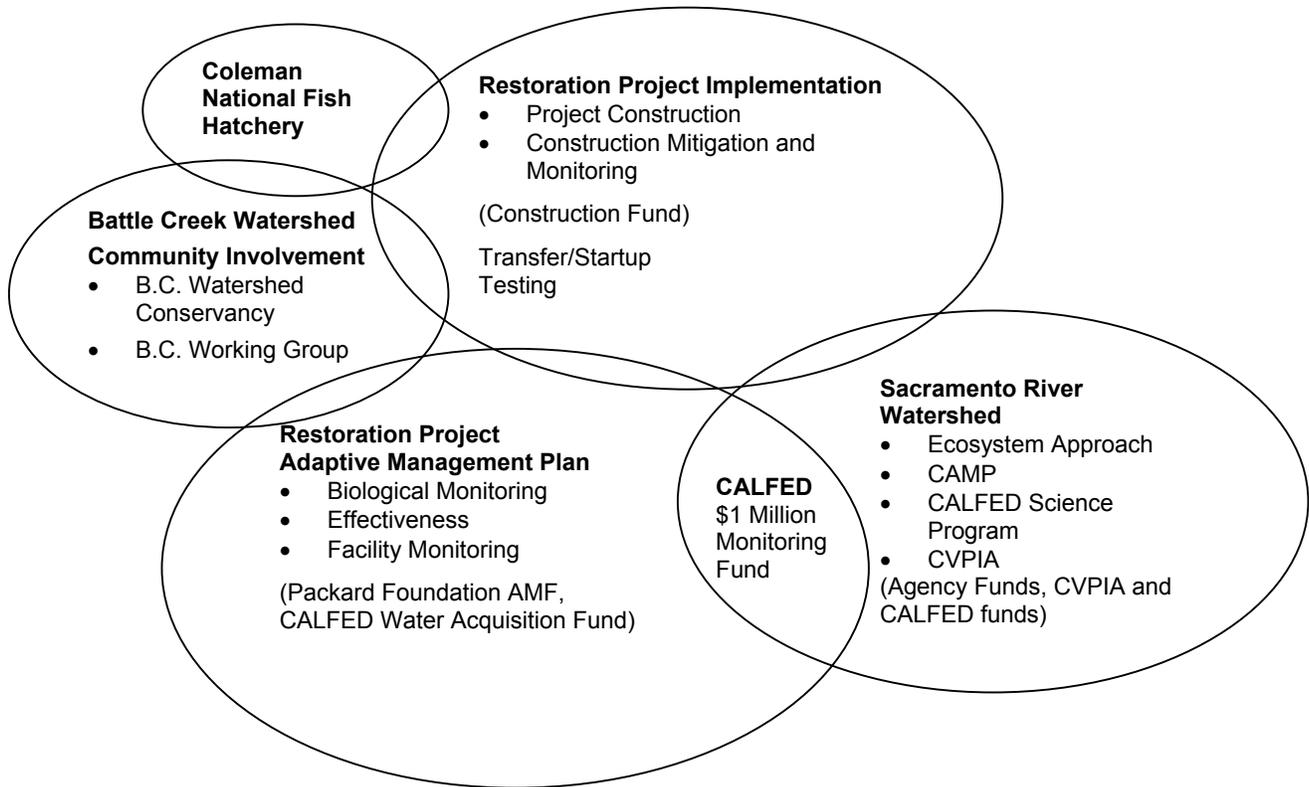


Figure 2. Institutional and funding relationships described in the Battle Creek Adaptive Management Plan with related watershed restoration programs and community involvement.

Although many anticipated limiting factors as well as many unanticipated circumstances have been outlined in the AMP, the plan acknowledges that not all events are predictable and, invariably, surprising circumstances will arise. However, it is the nature of Adaptive Management to design studies and management programs to adapt to unforeseen circumstances. Also, many unanticipated factors may be outside the scope of the Restoration Project. Just how an AMP responds to new circumstances is governed by a stepwise scientific process beginning with hypothesis testing of objectives through monitoring and data assessment. A timeline identifies the duration and order of monitoring activities and includes trigger events indicating that an Adaptive Management response is necessary. Adaptive Management responses would be evaluated to determine if the objective is being met and current actions should continue or if new actions are needed to meet the objectives. Adaptive Management responses could include any major or minor changes to the hydroelectric facility or the natural features of the Restoration Project. Responses to a trigger event will have limits identified by the FERC license amendment. Adaptive Management responses falling outside of those allowed by the FERC license amendment provisions would need to be addressed through established FERC processes. Key to the Adaptive Management process is a reporting regime consistent with the ability to design and evaluate responses to Adaptive Management actions.

The AMP objectives for the restoration of salmon and steelhead focus on improvements in population dynamics, improvements to the habitat, and improvements designed to ensure safe passage of adults and juveniles. The population objectives are (1) ensure successful salmon and steelhead spawning and juvenile production, (2) restore and recover the assemblage of anadromous salmonids (i.e., winter-run, spring-run, steelhead) that inhabit the stream's cooler reaches during the dry season, (3) restore and recover the assemblage of anadromous salmonids (i.e., fall-run, late-fall-run) that enter the stream as adults in the wet season and spawn upon arrival, and (4) ensure salmon and steelhead fully utilize available habitat in a manner that benefits all life stages, thereby maximizing natural production and full utilization of the ecosystem carrying capacity. Objectives focusing on improving the habitat of salmon and steelhead are (1) maximize habitat quantity through changes in instream flow, (2) maximize habitat quantity by ensuring safe water temperatures, (3) minimize false attraction and harmful fluctuation in thermal and flow regimes resulting from planned outages or detectable leaks from the hydroelectric project, and (4) minimize the stranding and isolation of salmon and steelhead resulting from variations in flow regimes caused by hydroelectric project operations. Objectives for the safe and reliable passage of salmon and steelhead are (1) provide upstream passage of adults at dams, (2) provide downstream passage of juveniles at dams, and (3) provide upstream passage of adults to their appropriate habitat over natural obstacles while ensuring appropriate levels of spatial separation between runs.

To determine if the population objectives of the AMP are being met, assessments of population size, trends in productivity, population substructure, and population diversity must be compared to corresponding guidelines set forth by NMFS. The AMP has adopted NMFS definitions of "viable populations" as the intermediate population goal and identifies the maximization of salmon and steelhead production and full utilization of carrying capacity as the final goal. The fish passage objectives are intended to assist in restoring natural process of dispersal and the habitat objectives will work to restore natural ecological variation associated with the natural function of the ecosystem. Further threats to population diversity not covered by the AMP objectives will be addressed through the AMP "linkages."

The AMP is just one aspect of the Restoration Project and is closely linked with the other elements of the Restoration Project. Other programs within the Restoration Project cover some aspects of restoration not covered in the AMP such as facility operations and maintenance. The AMP is also linked to non-project restoration programs affecting salmon and steelhead populations both within and outside the Battle Creek watershed.

The implementation of the AMP is governed by a set of protocols. Adaptive Management activities on private land will be conducted in a manner that respects landowners' rights and privacy and that minimizes disturbances and risks to private lands. Protocols governing data management are consistent with guidelines established by Comprehensive Monitoring, Assessment, and Research Program (CMARP) and the

Draft Adaptive Management Plan

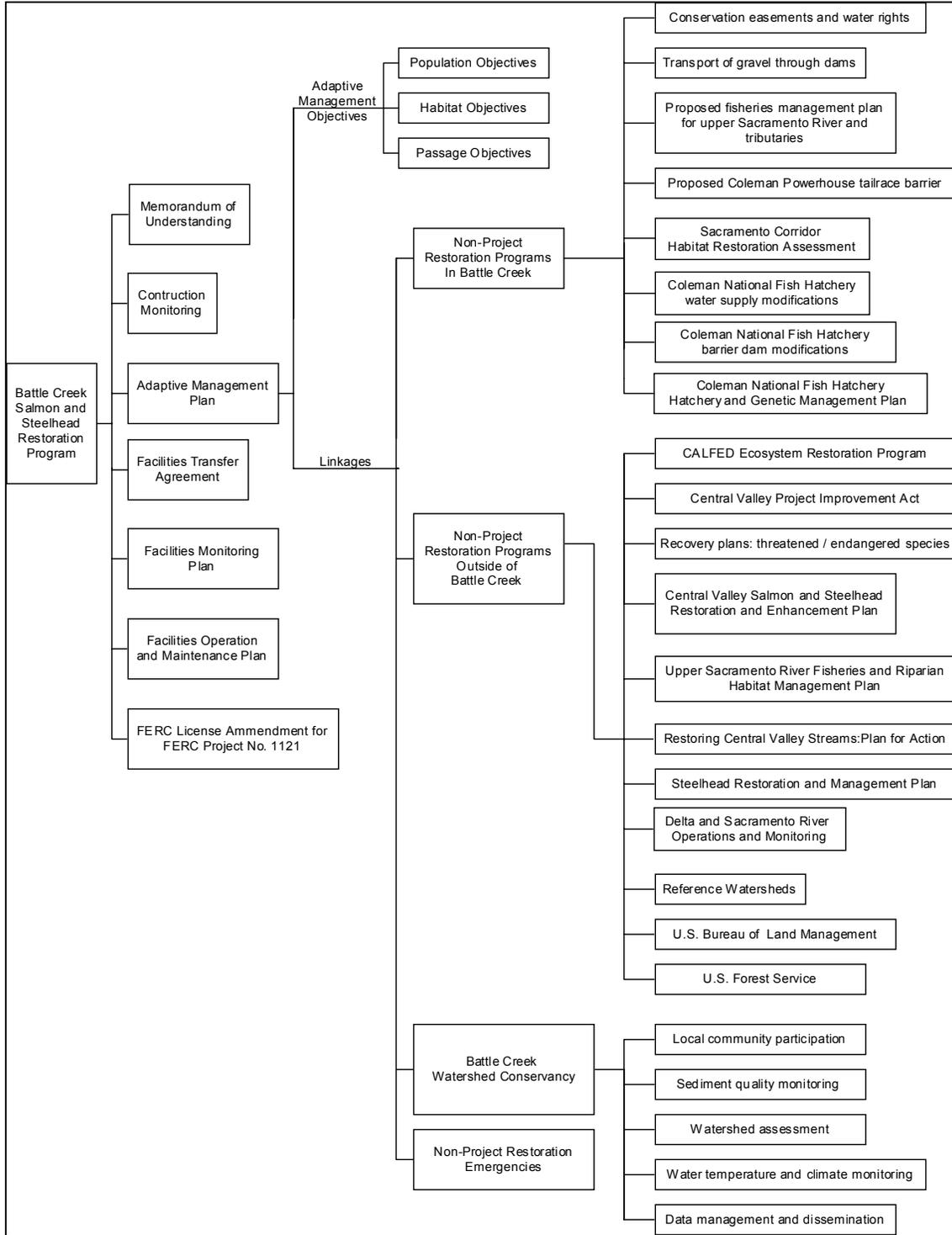


Figure 3. Schematic of the relationship of the Adaptive Management Plan and Adaptive Management objectives with other Restoration Project and non-project restoration activities that may affect salmon and steelhead in Battle Creek.

Draft Adaptive Management Plan

Environmental Protection Agency (EPA). Data and information will be made available to the public by dissemination to the appropriate agency information storage systems and an information system operated and maintained by the Battle Creek Watershed Conservancy (BCWC).

Meetings of the AMTT will be scheduled four times per year including an annual meeting in March, when possible Adaptive Management actions will be considered. The AMPT will meet at least annually in late March. These March meetings of the AMTT and AMPT are scheduled to finalize annual reports in time for funding agency deadlines. Ad hoc meetings may be scheduled by the AMTT or AMPT to address emergencies without advanced public notice, but such meetings will only consider the emergency at hand. All meetings will be open to the public, and all scheduled meetings will be announced to the public. Protocols also specify meeting announcement requirements, voting rules, report writing, Adaptive Management responses, proposal ranking, modification of Adaptive Management objectives, and dispute resolution.

The appendices contain tables, lists, and documentation useful to the understanding of the AMP. Monitoring activities and FERC license articles affected by Adaptive Management are all included in the appendices. The Literature Cited section contains the source material for all the references cited in the AMP.

TABLE OF CONTENTS

PREFACE.....	i
NOTES TO THE READER.....	ii
EXECUTIVE SUMMARY	iii
TABLE OF CONTENTS	x
I. INTRODUCTION.....	1
I.A. Setting	1
I.B. Document History and Purpose	1
I.C. Document Organization	3
I.D. Adaptive Management Process.....	4
I.D.1. Step 1: Review of Available Information.....	5
I.D.2. Step 2: Solution Identification and Development of Conceptual Models.....	10
I.D.3. Step 3: Solution Screening	11
I.D.4. Step 4: Specification of Criteria of Success	13
I.D.5. Step 5: Solution Implementation	14
I.D.6. Step 6: Adaptive Responses	14
I.E. Experimentation.....	15
I.E.1. Experimentation in Problem Definition and Solution Development	15
I.E.2. Experimentation in the Overall Adaptive Management Effort	16
I.E.3. Experimentation Within Component Objectives	17
I.F. Definitions	17
II. ORGANIZATION	20
II.A. Structure.....	20
II.A.1. Adaptive Management Policy Team	20
II.A.2. Adaptive Management Technical Team.....	20
II.B. Roles and Responsibilities	21
II.B.1. Licensee.....	21
II.B.2. NMFS	23
II.B.3. USFWS.....	24

II.B.4.	CDFG	25
II.C.	Funding	26
II.C.1.	CALFED Monitoring Fund	26
II.C.2.	Water Acquisition Fund	26
II.C.3.	Adaptive Management Fund	29
II.C.4.	Licensee Commitment.....	30
II.D.	Term.....	30
II.D.1.	Water Acquisition Fund	31
II.D.2.	Adaptive Management Fund	31
II.D.3.	FERC License.....	31
III.	ADAPTIVE MANAGEMENT OBJECTIVES	31
III.A.	Objective Table Format	34
III.B.	Population Objectives	37
III.B.1.	Population Size.....	37
III.B.2.	Trends in Productivity	38
III.B.3.	Population Substructure	40
III.B.4.	Population Diversity.....	40
III.B.5.	Carrying Capacity.....	41
III.C.	Habitat Objectives.....	47
III.D.	Passage Objectives.....	52
IV.	LINKAGES WITH OTHER PROGRAMS	56
IV.A.	Restoration Project Planning	56
IV.A.1.	Memorandum of Understanding	57
IV.A.2.	Construction Monitoring	57
IV.A.3.	Facilities Transfer Agreement	57
IV.A.4.	Facilities Monitoring Plan.....	58
IV.A.5.	Operations and Maintenance Plan.....	58
IV.B.	Non-Project Restoration Programs in Battle Creek.....	59
IV.B.1.	Conservation Easements and Conservation Water Rights	59
IV.B.2.	U.S. Forest Service.....	60
IV.B.3.	Proposed Comprehensive Fisheries Management Plan for the Upper Sacramento River and Tributaries	60
IV.B.4.	Sacramento Corridor Habitat Restoration Assessment	60
IV.B.5.	Coleman National Fish Hatchery Water-Supply Intake Modifications.....	61
IV.B.6.	Proposed Coleman Powerhouse Tailrace Barrier Construction	61

Draft Adaptive Management Plan

IV.B.7.	Modifications to the Coleman National Fish Hatchery Barrier Dam	61
IV.B.8.	Coleman National Fish Hatchery Biological Assessment and Associated Biological Opinion.....	62
IV.C.	Non-Project Restoration Programs Outside Battle Creek.....	63
IV.C.1.	CALFED Ecosystem Restoration Program.....	63
IV.C.1.a.	Comprehensive Monitoring, Assessment, and Research Program/CALFED Science Program	67
IV.C.2.	Central Valley Project Improvement Act.....	68
IV.C.2.a.	Anadromous Fish Restoration Program.....	68
IV.C.2.b.	Comprehensive Assessment and Monitoring Program	69
IV.C.3.	Recovery Plans for Threatened or Endangered Salmonids	70
IV.C.4.	Central Valley Salmon and Steelhead Restoration and Enhancement Plan	70
IV.C.5.	Upper Sacramento River Fisheries and Riparian Habitat Management Plan	70
IV.C.6.	Restoring Central Valley Streams—A Plan for Action.....	70
IV.C.7.	Steelhead Restoration and Management Plan for California	71
IV.C.8.	Delta and Sacramento River Operations and Monitoring	71
IV.C.9.	Reference Watersheds	72
IV.D.	Battle Creek Watershed Conservancy	72
IV.D.1.	Potential Local Community Participation	72
IV.D.2.	Suggested Monitoring Tasks	74
IV.D.2.a.	Sediment Quality Monitoring	74
IV.D.2.b.	Ongoing Watershed Assessment.....	74
IV.D.2.c.	Water Temperature and Climate Monitoring.....	74
IV.D.2.d.	Data Management and Dissemination	74
IV.E.	Non-Restoration Project Emergencies.....	75
V.	PROTOCOLS	75
V.A.	Adaptive Management Activities on Private Land	75
V.B.	Data Management	77
V.C.	Process	78
V.C.1.	Meeting Schedule	78
V.C.2.	Meeting Process	79
V.C.3.	Reporting.....	80
V.C.4.	Adaptive Response Process.....	80
V.C.5.	Prioritizing Response Proposals	81

Draft Adaptive Management Plan

V.C.6. Budget Review82

V.D. Monitoring and Data Assessment82

V.E. Funds Management.....83

V.F. Dispute Resolution.....84

 V.F.1. Disputing Party—Licensee.....84

 V.F.2. Disputing Party—Resource Agency85

 V.F.3. Water Acquisition Fund85

 V.F.4. Adaptive Management Fund86

VI. APPENDIX LISTING AMP MONITORING ACTIVITIES87

**VII. APPENDIX OF PROPOSED FERC LICENSE ARTICLES AFFECTED
 BY ADAPTIVE MANAGEMENT91**

VIII. LITERATURE CITED.....91

LIST OF TABLES

1. A list of acronyms used within this report. ii

2. The six steps of passive adaptive management identified by the CALFED
Independent Science Board (Healey 2001).....5

3. Components of the Battle Creek Salmon and Steelhead Restoration Project13

4. Adaptive Management objectives of the Battle Creek Salmon and Steelhead
Restoration Project.....33

5. NMFS viable population size guidelines.....38

6. NMFS trends and productivity guidelines.....39

7. NMFS spatial structure guidelines.40

8. NMFS diversity guidelines.....41

9. Predicted population sizes of chinook salmon and steelhead in Battle Creek
after implementing restoration measures outlined in USFWS (1995).....42

10. Linkages between the Adaptive Management of the Battle Creek Restoration
Project and other planning or restoration programs and directives.56

11. CALFED Ecosystem Restoration Program visions for ecosystem elements and
how the Restoration Project and Adaptive Management Plan achieve
these visions.64

Appendix Table 1. Adaptive Management monitoring field studies and analysis.87

Appendix Table 2. Possible adaptive management diagnostic analysis and field
studies (the need for these will be determined through AMP
monitoring and protocols).....90

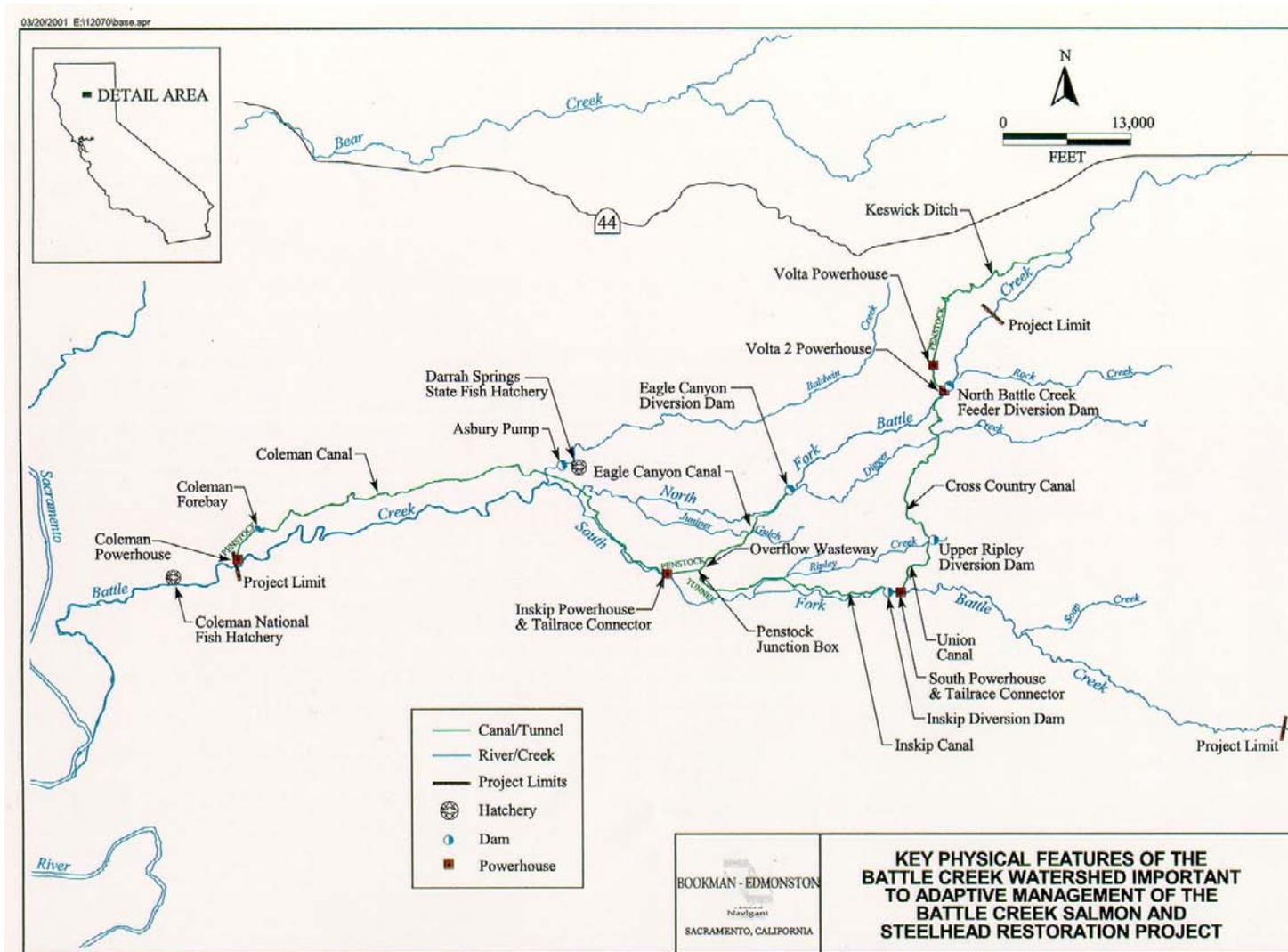
LIST OF FIGURES

1 CALFED schematic of adaptive management. iv

2. Institutional and funding relationships described in the Battle Creek Adaptive
Management Plan with related watershed restoration programs and
community involvement. vi

3. Schematic of the relationship of the Adaptive Management Plan and Adaptive
Management objectives with other Restoration Project and non-
project restoration activities that may affect salmon and steelhead in
Battle Creek. viii

4. Flow chart depicting components of all adaptive management objectives and
the general relationships between the various components.35



Location Map: Battle Creek Salmon and Steelhead Restoration Project

I. INTRODUCTION

I.A. Setting

Battle Creek is a tributary of the Sacramento River located in Tehama and Shasta Counties. This cold, spring-fed stream has exceptionally high flows during the dry season, making it important habitat for anadromous fish. Battle Creek may be the only remaining stream other than the main stem of the Sacramento River that can successfully sustain breeding populations of steelhead and all four runs of chinook salmon. Battle Creek is also unique and biologically important because its numerous cold-water springs provides habitat opportunities during drought years for winter-run chinook salmon.¹

Pacific Gas and Electric Company (PG&E) owns and operates several hydroelectric power diversion facilities on the North and South Forks of Battle Creek, including Coleman Division Dam, Inskip Diversion Dam, South Diversion Dam, Wildcat Diversion Dam, Eagle Canyon Diversion Dam, and North Battle Creek Feeder Diversion Dam, and dams on Ripley Creek, Soap Creek, and Baldwin Creek. PG&E controls the majority of the flows in the anadromous fish reaches of the Battle Creek watershed.²

I.B. Document History and Purpose

In June 1999, PG&E, National Marine Fisheries Service (NMFS), California Department of Fish and Game (CDFG), U.S. Fish and Wildlife Service (USFWS), and U.S. Bureau of Reclamation (USBR) entered into a Memorandum of Understanding (MOU) that signaled the intent of these MOU parties to pursue a salmon and steelhead restoration effort on Battle Creek that would modify the facilities and operations of PG&E's Battle Creek Hydroelectric Project (Federal Energy Regulatory Commission [FERC] Project No. 1121). Consequently, a federal-state interagency program known as the CALFED Bay-Delta Program (CALFED) provided \$28 million in directed funding for the planning and implementation commitments of the Resource Agencies' portions of any approved project elements resulting from the proposed Battle Creek Salmon and Steelhead Restoration Project (Restoration Project).³

The MOU parties agreed that Adaptive Management is an integral component of the Restoration Project. Adaptive Management is a process that (1) uses monitoring and research to identify and define problems; (2) examines various alternative strategies and actions for meeting measurable biological goals and objectives; and (3) if necessary, makes timely adjustments to strategies and actions based upon best scientific and commercial information available.⁴

¹ MOU 1.1

² MOU 1.2

³ Notice of Preparation Project Background

⁴ MOU 9.0

Draft Adaptive Management Plan

The primary reason for using an Adaptive Management process is to allow for changes in the restoration strategies or actions that may be necessary to achieve the long-term goals and/or biological objectives of the Restoration Project and to ensure the likelihood of the survival and recovery of naturally-spawning chinook salmon and steelhead. Using Adaptive Management, restoration activities conducted under the Restoration Project will be monitored and analyzed to determine if they are producing the desired results (i.e., properly functioning habitats).⁴

To formalize the use of Adaptive Management in the Restoration Project, an Adaptive Management Plan (AMP) was developed by PG&E, the NMFS, USFWS, and CDFG (collectively known herein as “Parties”). Biological goals are the broad guiding principles for the AMP and are the rationale behind the minimization and mitigation strategies and/or actions. Specific biological objectives are the measurable targets for achieving the biological goals. The goal of the AMP is to implement specific actions to protect, restore, enhance, and monitor salmonid habitat at FERC Project No. 1121 to guard against false attraction of adult migrants and ensure that chinook salmon and steelhead are able to fully access and utilize available habitat in a manner that benefits all life stages and thereby maximizes natural production, fully utilizing ecosystem carrying capacity.⁵

As implementation of the Restoration Project proceeds, results will be monitored and assessed. If the anticipated goals and objectives are not being achieved, then adjustments in the restoration strategy or actions will be considered through the AMP, which has been developed consistent with the relevant CALFED guidelines. A Water Acquisition Fund (WAF), Adaptive Management Fund (AMF), and Licensee Commitment are elements of Adaptive Management which will provide funding for potential changes to Restoration Project actions that result from application of the AMP.⁴

The AMP will be submitted by PG&E to the FERC at the time that PG&E files its license amendment application pursuant to the MOU. The Parties acknowledge that implementation of the AMP could later involve proposals for changes in operations, project facilities, and possible decommissioning of some additional FERC Project No. 1121 facilities to improve biological effectiveness and habitat values for chinook salmon or steelhead.⁶

The AMP is designed to be consistent with and fulfill the goals and objectives of the Restoration Project. The primary goal of the Restoration Project is to restore and enhance approximately 42 miles of anadromous fish habitat in Battle Creek plus an additional 6 miles of habitat in its tributaries while minimizing the loss of clean (emission-free), renewable energy produced by the Battle Creek Hydroelectric Project. The primary objective of the Restoration Project is to provide increased habitat and reliable upstream and downstream migration routes for salmonids. Reliable migration

⁵ MOU 9.1.A.2.(a). Ecosystem carrying capacity is not specifically defined in the MOU or AMP. Rather, the use of that term in this document conforms to the sense of the definition of “maximum carrying capacity” in Odum (1983), which says that theoretical maximum carrying capacity is reached when no further increase in the size of a population occurs because maintenance energy costs balance available energy.

⁶ MOU 9.1

routes for salmonids refers not only to safe passage but also includes measures that allow returning adult salmonids to find their natal streams by minimizing the false attraction of North Fork fish to the South Fork of Battle Creek. Current hydroelectric project operations result in the transfer of most of the natural flow of the North Fork to the South Fork, which could cause false attraction of returning adult migrants born in the North Fork to the South Fork.

The MOU described the following goals, or benefits, of the Restoration Project: restoration of self-sustaining populations of chinook salmon and steelhead and their habitat in the Battle Creek watershed through a voluntary partnership with state and federal agencies, the Packard Foundation, and PG&E;⁷ up-front certainty regarding specific restoration components;⁸ timely implementation and completion of restoration activities;⁹ and joint development and implementation of a long-term AMP with dedicated funding sources to ensure the continued success of restoration efforts under this partnership.¹⁰ Furthermore, implementation of the Restoration Project will be consistent with the following restoration directives and programs:

- Central Valley Project Improvement Act (Public Law 102-575 Section 3401 et seq. [CVPIA]) Anadromous Fish Restoration Program (AFRP);
- State Salmon, Steelhead Trout, and Anadromous Fisheries Program Act (State Senate Bill 2261, 1990) Central Valley Salmon and Steelhead Restoration and Enhancement Plan;
- NMFS Recovery Plan for Sacramento River Winter-Run Chinook Salmon;
- CALFED Ecosystem Restoration Program (ERP);
- Upper Sacramento River Fisheries and Riparian Habitat Management Plan (State Senate Bill 1086, 1989);
- Restoring Central Valley Streams- A Plan for Action (1993); and
- Steelhead Restoration and Management Plan for California (1996).¹¹

I.C. Document Organization

This document was written to provide a complete understanding of the adaptive management process as applied to the Restoration Project and to serve as a procedural and planning reference tool for Contemporary managers of the Restoration Project and Battle Creek fisheries. However, it was not written to be a “stand-alone” document in that it does not include all background and reference documentation; rather, it depends directly on key supporting documents including, primarily, the Battle Creek Salmon and Steelhead Restoration Plan (Restoration Plan), the CALFED Ecosystem Restoration Plan (CALFED 1999), and the Facility Monitoring Plan, which is currently being prepared per the MOU for matters of regulatory compliance. Users of this document who are

⁷ MOU 1.4.A

⁸ MOU 1.4.B

⁹ MOU 1.4.C

¹⁰ MOU 1.4.D

¹¹ MOU 1.7

Draft Adaptive Management Plan

interested in learning more about the foundation of the Restoration Project and related actions, the initial steps in the adaptive management process used to develop this plan, or historical details of the restoration planning process are invited to read the Restoration Plan (Ward and Kier 1999a), MOU, and several other restoration plans that include Battle Creek (CALFED 1999; Ward and Kier 1999b; USFWS 1997; Bernard et al. 1996; CDFG 1996, 1993, 1990; USRFRHAC 1989; CACSST 1988; Hallock 1987). Users of this document who are interested in learning more about the current and proposed activities at Coleman National Fish Hatchery (CNFH) are encouraged to peruse the Biological Assessment (BA), which describes and assesses impacts of current or proposed operations of the CNFH and Livingston Stone National Fish Hatchery on listed populations of anadromous salmonids in the Central Valley under the Endangered Species Act (ESA) (USFWS 2001a).

This AMP is divided into four major sections. The first section, Organization, describes the structure of the Adaptive Management technical and policy teams, the roles and responsibilities of the Parties to the MOU, Adaptive Management funding, and the term of the AMP. The following two technical chapters implicitly recognize the fact that many factors, including the Restoration Project and factors outside of the control of the Restoration Project, will affect the eventual restoration of salmon and steelhead in Battle Creek. Therefore, the section titled Adaptive Management Objectives describes specific Adaptive Management objectives pertaining to the future Adaptive Management of Restoration Project elements, and the scientific methodology associated with Adaptive Management of salmon and steelhead populations, habitat, and passage directly affected by the Restoration Project. Linkages with Other Programs describes the linkages between the Adaptive Management of Restoration Project elements and other state and federal restoration programs and directives not directly related to the Restoration Project or with other Restoration Project planning that is not related to Adaptive Management. The Protocols section describes procedural rules that will govern the Adaptive Management process. Finally, the AMP includes appendices that list AMP and monitoring activities; objectives and concepts that have been considered and rejected for inclusion in the AMP; proposed FERC license articles affected by Adaptive Management; and the literature cited in this document.

The AMP sets policy regarding the management of Restoration Project-related fish populations, habitat, and passage when the MOU does not specifically address a policy issue. However, in cases where the language in the AMP may conflict with the MOU, policy regarding these topics will be set by the MOU. The MOU prevails in any discrepancy between policy specified in the AMP and that set by the MOU.

I.D. Adaptive Management Process

The intent of the adaptive management process is to permit the power of scientific problem solving (experimentation) to be built into management actions in a way that develops better resource management systems (Healey 2001; Walters 1986). The adaptive management process proceeds from definition of a management problem to the modeling of system dynamics and anticipated responses to management options. From

an evaluation of anticipated system response, adaptive management then proceeds to the implementation of specific management option(s) in ways that allow system response to be detected. Finally, monitoring is based on the hypothesized system dynamics and reassessment of the problem, while management actions follow from the results of monitoring (Figure 1; Healey 2001).

The concept of adaptive management is evolving. Presently, there are two overall approaches recognized: active and passive. In general, the active approach applies several proposed management options separated by time or location as a means to discriminate among competing hypotheses of system dynamics. Conversely, the passive approach implements the single most promising management option and monitors its effectiveness versus anticipated results.

In the case of the Restoration Project, a number of actions are being implemented simultaneously as the initial starting point, including instream flow increases, release of cold spring water to streams, passage facility improvements, elimination of potential sources of false attraction to migrating adult fish, and isolation of hydroelectric project water fluctuations from the natural stream reaches. Following the application of this initial array of actions, passive adaptive management will be the tool used to monitor effects of the Restoration Project and to apply further modifications where warranted.

The following subsections briefly explain the six steps in passive adaptive management (Table 2), how those steps were carried out in the development of this AMP, and where the reader may find more information about those steps.

Table 2. The six steps of passive adaptive management identified by the CALFED Independent Science Board (Healey 2001).

1. Review the available information to define the problem as precisely as possible.
2. Develop plausible solutions to the management problem. Describe these in terms of conceptual models of system behavior and its response to possible management interventions.
3. Subject these solutions to some form of structured analysis (simulation modeling is a useful analytic tool) to determine which offers the greatest promise of success.
4. Specify criteria (indicators, measures) of success or failure of the most promising solution
5. Implement the most promising solution and monitor the system response according to the criteria developed in Step 4.
6. Adjust the design of the solution from time to time according to the results of monitoring in an attempt to make it work better.

I.D.1. Step 1: Review of Available Information

The first step in formalized passive adaptive management is to review existing information in order to define the management problem as precisely as possible (Table 2; Healey 2001). In the case of Battle Creek, the management problem, at its grossest level, was how to restore currently-depressed numbers of anadromous salmonids, in a watershed that historically was one of the most diverse and productive salmon and steelhead streams in the Sacramento River.

Draft Adaptive Management Plan

The gross-level fishery management problem, low numbers of anadromous salmonids in Battle Creek, was more clearly defined through several restoration planning documents that were based on Contemporary best available science. For example, Hallock (1987) recommended that a salmon restoration plan be developed for Battle Creek upstream of the CNFH. He felt that the major factor suppressing salmon populations was decreased instream flows caused by the PG&E hydroelectric project and that restoration of stream flows could support populations of between 6,000 and 10,000 fall-run salmon, 2,500 spring-run salmon, and 1,000 steelhead. The hydroelectric project can divert up to 97 percent of the natural base-flow of the stream and all the major cold-water springs.

The Upper Sacramento Fisheries and Riparian Habitat Advisory Council, established in 1986 by California Senate Bill 1086, generated a fisheries and riparian habitat management plan which also cited hydroelectric development, and the operation of the CNFH, as the two primary causes for low populations of naturally reproducing salmon and steelhead in Battle Creek. This plan called for:

- Increased and stabilized instream flows downstream of hydroelectric project diversions;
- Installation of fish screens at project diversions;
- Modification of the practice of removing gravel from behind project dams;
- Releasing a portion of salmon and steelhead runs, including a continuation of the practice of releasing excess fall chinook salmon, to Battle Creek upstream from the CNFH;
- Completion of habitat studies;
- The development of a specific anadromous fish management plan for Battle Creek and the CNFH.

During the late 1980s, a comprehensive fisheries investigation was performed on Battle Creek. Component studies of this investigation provided much of the scientific foundation for subsequent restoration planning. The several components of the fisheries investigation included studies of (1) instream flow (TRPA 1998a), (2) species habitat criteria, (3) fish passage barriers (TRPA 1998b), (4) water temperature (TRPA 1998c, 1998d), (5) fish species abundance (TRPA 1998e), (6) hydrology, (7) sediment and gravel recruitment, and (8) hatchery interactions.

In the early 1990s, another plan was developed to restore and enhance salmon and steelhead in the Central Valley (CDFG 1990). This plan also called for increased instream flows and effective fish screens on Battle Creek. The final recommendations of the California Advisory Committee on Salmon and Steelhead Trout were adopted in Senate Bill 2261, passed in 1988, which in turn led to the development of “A Plan for Action” (CDFG 1993). This document called for increased stream flows, improving fish passage at Eagle Canyon Dam, installation of fish screens at agricultural and hydroelectric project diversions, passage of fall chinook salmon above the CNFH to spawn naturally in Battle Creek, and preparation and implementation of a comprehensive

plan to restore winter and spring chinook salmon and steelhead to Battle Creek. One offshoot of the “Plan for Action” was the development of the Steelhead Restoration and Management Plan for California, including Battle Creek (CDFG 1996).

The most definitive attempt to define management problems in Battle Creek began in 1997 with a CalFed Category III contract for development of a comprehensive technical plan to guide implementation of restoration planning efforts and receive advice from interested and affected parties. This effort was completed under the supervision of the Battle Creek Working Group (BCWG)¹² and culminated in the Restoration Plan and an addendum (Ward and Kier 1999a, 1999b). These two documents summarized instream habitat studies that used best available science in the 1980s (TRPA 1998a, 1998b, 1998c, 1998d, 1998e) and the existing conditions in Battle Creek in the late 1990s including discussions of geology and hydrology, fish populations, selected stream-dependent plants and animals, the history of the Battle Creek watershed including hydroelectric project and hatchery operations that contributed to the decline of Battle Creek’s anadromous salmonids, Sacramento River fisheries management and environmental factors, and summaries of past and contemporary restoration efforts. The “Technical Plan” section of the Restoration Plan described goals, objectives, and models for the restoration of ecosystem processes in Battle Creek and documented an analysis of anadromous fish habitat in Battle Creek including, among many others, perceived limiting factors such as instream flow, water temperature, removal of cold-water spring flow, fish passage problems at dams and natural features, and false attraction resulting from hydroelectric project operations. These two documents also examined perceived limiting factors associated with the operations of the CNFH. All limiting factor analyses within these two reports were based on explicit and implicit conceptual models consistent with the formal adaptive management process.

The Restoration Plan (Ward and Kier 1999a) provided detailed recommendations regarding Battle Creek’s hydroelectric-related management problems and, to a lesser extent, watershed activities and CNFH management options. Potential solutions for Battle Creek’s fishery management problems included actions supporting salmonid restoration in the Battle Creek uplands, in Battle Creek upstream of anadromous fish habitat, and within anadromous fish habitat of Battle Creek; a list of evaluations and studies necessary for salmonid restoration to decrease uncertainty involved in solution identification; and monitoring that would be necessary to ensure that any restoration projects were successful.

The conclusion of the initial “problem definition” step of adaptive management, reached during a long period of restoration planning, resulted in rather precise definitions of the management problem. The gross-level problem of “how to restore anadromous fish” was refined to a list of problem areas that needed to be improved for fish restoration (Ward and Kier 1999a), including:

¹² The BCWG was established by interested and affected parties associated with implementation of the CVPIA to develop an implementation plan for Battle Creek that is effective and has community acceptance. It included representatives of at least 18 agencies and stakeholders. All of the Adaptive Management Parties, including PG&E, USFWS, CDFG, NMFS, and USBR, were represented in the BCWG.

Draft Adaptive Management Plan

- Insufficient instream flows below PG&E diversion dams limits fish production;
- Removal of inflow from major cold-water springs to stream reaches reduces the amount of cold-water habitat at low elevations;
- Water allocated to fish restoration is at risk of future reallocation to off-stream uses;
- Ramping procedures below diversion dams did not meet the intent of state and federal endangered species laws;
- False attraction of anadromous salmonids from the North Fork to the South Fork leads to unstable population structure and loss of production in the more drought-tolerant North Fork and potentially leads to fish mortality;
- Fish passage facilities at dams did not provide safe passage of adult and juvenile salmonids;
- False attraction of anadromous salmonids to the Coleman Powerhouse tailrace potentially causes fish mortality and/or loss of production;
- Natural barriers at Panther Creek on the South Fork limit the habitat available to anadromous salmonids, according to a 1983 assessment of fish passage barriers, but not according to recent observations (CDFG 2001a, 2001b) that indicate the feature is not a barrier at high flow;
- Fish passage barriers and low amounts of spawning gravels in a one-half mile reach of Baldwin Creek limit steelhead production;
- Fish pathogens flow from salmon habitat to the CNFH's primary water supply on Coleman Canal via hydroelectric project diversions and water conveyance systems and might impact the CNFH during times when its ozonation system is inoperative (the ozonation system became operational in 2000; USFWS 1998); and
- A lack of institutional controls and automated mechanisms prevent fish entrainment and fluctuating instream flows.

Many other items were excluded from the list because they were not seen as limiting factors or key components of the management problem. These include:

- Gravel recruitment processes are not disturbed,
- No gravel mining exists in the watershed,
- Gravel routing at diversion dams has been addressed by operational procedures,
- Riparian community structure is healthy,
- Upland land use is isolated from stream channels,
- Channel geomorphology is not impaired because diversions do not significantly impact channel maintenance flows, and

- Exotic fish species would be restricted in range, abundance and impact under restored flow conditions,

Also excluded from the problem definition, because they were addressed by other ongoing management efforts, were such factors outside the Battle Creek watershed as:

- Water diversions impacts in the Sacramento River,
- Sacramento/San Joaquin Delta conditions,
- Commercial and sport fishing, and
- Oceanographic conditions.

Finally, the Restoration Plan and its addendum, “Maximizing Compatibility between Coleman National Fish Hatchery Operations, Management of Lower Battle Creek, and Salmon and Steelhead Restoration” (Ward and Kier 1999b), indicated that there was a great deal of uncertainty that Contemporary operations at the CNFH would be fully compatible (as characterized by USFWS 1994) with timely recovery of salmon and steelhead in the restored habitat. The USFWS is currently engaged in an ongoing CNFH Reevaluation Process aimed at identifying potential conflicts between existing hatchery operations and the restoration program and evaluating potential alternative operational strategies to ensure that the CNFH does not impede the restoration of natural salmon and steelhead populations in Battle Creek. Problem definition and solution identification at the CNFH adequate for formal adaptive management were not completed in these reports.

Following completion of these restoration planning documents, PG&E, NMFS, CDFG, USFWS, and USBR undertook a series of negotiations consistent with the formal adaptive management process to further identify solutions to Battle Creek’s management problems. The MOU, adopted in June 1999, stated the intent of these MOU parties to engage in a restoration effort that would modify the facilities and operations of FERC Project No. 1121. The objectives of the Restoration Project are (1) the restoration of self-sustaining populations of chinook salmon and steelhead and their habitat in the Battle Creek watershed, (2) up-front certainty regarding specific restoration components, (3) timely implementation and completion of restoration activities, and (4) joint development and implementation of a long-term AMP with dedicated funding sources to ensure the continued success of restoration efforts under this partnership.

Restoration and monitoring activities currently under way or planned for Battle Creek are guided by the goals, objectives, and strategies developed in the AFRP Plan (USFWS 2001b). To facilitate restoration of natural salmonid populations in Battle Creek, the CNFH’s operations need to be made compatible with the AFRP guided recovery process (USFWS 1994, 1998). Major changes under way at the CNFH include modifications to the hatchery’s barrier weir and upstream ladder, improvements to or screening of the water intakes, and construction of an ozone water treatment plant (USFWS 2000a).

I.D.2. Step 2: Solution Identification and Development of Conceptual Models

The second step in formalized passive adaptive management is to develop plausible solutions to the management problem and describe these in terms of conceptual models of system behavior and likely responses to possible management interventions (Table 2; Healey 2001). In the case of Battle Creek, the initial, grossest-level solution identification was conducted by a subgroup of the BCWG that did not include PG&E. In January 1998, this subgroup released the working paper “A Time For Action,” which was intended to catalyze the planning process by suggesting a list of possible restoration actions (BCWG 1998). Biological, socioeconomical, and political analyses were then conducted in response to this working paper, including the description of alternative solutions in terms of conceptual models of system behavior.

The overarching conceptual model employed in Battle Creek was the development of a classification system that anticipated the maximum potential restored fish habitat by stream reach and species. Each stream reach within the project-affected portion of the Battle Creek watershed was categorized by professional judgment using a system of five grades based on such attributes as potentially restorable temperature regime, cold-water accretions from springs, physical habitat characteristics, species life history, length of stream reach, stream gradient, reach elevation, and past observations in similar watersheds.¹³ This overarching conceptual model was supported by the use of reference streams (e.g., Mill and Deer Creeks, Little Sacramento and McCloud Rivers) and the importance of abundant cold-water spring resources.

This overarching conceptual model was then strengthened by the use of more specific, biological models of key stream reach attributes such as instream flow and potentially usable fish habitat, spawning gravel surveys, water temperature, natural fish passage barriers, and fish passage at diversion dams. Instream flow and available fish habitat were modeled by TRPA (1998a) using the instream flow incremental methodology (IFIM), which described the relationship between instream flow and the quantity of fish habitat in each reach of the project-affected area for several fish species and lifestages. This instream flow model was interpreted using an limiting life stage model that assessed the relative importance of habitat for three life stages of chinook salmon, including fry, juvenile, and spawning, through the use of a mathematical model that determined, for each reach, which type of habitat limited production under varying flow regimes. Water temperatures, under possible alternative solutions to the management problem, were modeled using the SNTMP model (Tu 2001; TRPA 1998c, 1998d) to ensure that thermal regimes would approximate those found in other streams supporting spring-run chinook. Natural fish passage barriers were analyzed by field measurements and the use of a model that helped determine at which flow a potential barrier would become impassable to migrating chinook and steelhead. Fish passage at diversion dams was considered in light of state and federal standards for fish ladders and criteria for fish screens that have been established to maximize the effectiveness of fish

¹³ The concept of Reference Watersheds was developed to “ground-truth” the stream classification system and is used frequently throughout the Adaptive Management process to assess conceptual models, to screen solutions, and to develop criteria for measuring the success of the identified solution.

ladders and screens to salmon and steelhead. Furthermore, the cost of fish passage facility modifications was compared with diversion dam decommissioning. Finally, economic models of power production were used to estimate economic impacts of various restoration efforts.

I.D.3. Step 3: Solution Screening

The third step in formalized passive adaptive management is to subject alternative solutions to some form of structured analysis (e.g., simulation modeling) to determine which offers the greatest promise of success (Table 2; Healey 2001). In the Battle Creek case, the BCWG employed various technical models and a series of four formal policy-level screening mechanisms.

The overarching screening mechanism employed in Battle Creek was the concept of ecosystem function. As mandated by CVPIA and CALFED legislation, all possible solutions were screened to ensure that measures undertaken for the benefit of salmon and steelhead would address ecosystem functions or processes (Ward and Kier 1999a).

Alternative solutions were also screened by the policy concept of “stream-dependent economic values” to ensure that possible solutions would minimize the economic impact of fish restoration on the Battle Creek Hydroelectric Project and to ensure the project’s viability; not change any consumptive water rights within the Battle Creek watershed and not impact existing agriculture; and provide benefits to commercial fisheries and recreational industries including fishing clubs and guide services by providing more fish to catch.

Another policy concept, “Maximum Potential Restoration,” was used to screen solutions. Technical models used in identifying solutions considered ecological characteristics (e.g., habitat descriptions, species prioritization, and temperature regimes) that would be achieved under “maximum potential restoration” or terms similar to “reliable,” “complete,” or “full” restoration. In general, these tools are used to set targets for what could be achieved if every identified problem affecting anadromous salmonids could be eliminated. Due to the reality of limited restoration funds, the stated goal of balancing restoration with stream-dependent economic values, and other sociopolitical realities, the BCWG acknowledged that not all possible restoration actions would be implemented as a result of the Restoration Plan. However, they felt these compromises would be best addressed in the recommendations and subsequent restoration actions, rather than to bias the tools used to evaluate the potential for restoration. Therefore, tools used in solution identification generally considered the maximum potential for restoration. An ancillary policy concept was that significant amounts of public monies were identified for the Restoration Project, creating an expectation that the actions would be highly certain and reliable compared to normal regulatory processes.

Finally, three policy-level “Biological Principles” were used by the USFWS, NMFS, CDFG, and USBR to screen solutions: biological effectiveness, restoring natural processes, and biological certainty. Solutions were required to incorporate the most biologically effective remedies that provide the highest certainty to successfully restore

Draft Adaptive Management Plan

ecosystem functions and self-sustaining populations of native fish in a timely manner. However, hatchery programs to supplement fish populations were not considered because such programs are only one possible element of a recovery planning process led by NMFS that is still under way. Solutions were required to incorporate measures that mimic the hydrologic conditions under which Battle Creek anadromous fish resources evolved by increasing base flows and eliminating the mixing of North Fork and South Fork waters. These solutions were to include the removal of diversions at major springs (e.g., in Eagle Canyon and Soap Creek) and the removal of low-elevation dams that fish must pass to reach cold water (e.g., Wildcat and Coleman Diversion Dams). Solutions were required to provide maximum long-term effectiveness by minimizing long-term dependence on the integrity of man-made restoration actions and the cooperation of future project owners and operators.

Technical-level models were used for screening purposes in many applications (see Ward and Kier 1999a for a complete discussion of all technical analyses used by the BCWG). For example, the IFIM instream model and the limiting life-stage model were used to screen alternatives. In particular, the Biological Team of the BCWG spent nearly a year screening countless alternative instream flow regimes to arrive at a flow regime (named “biologically optimum flows”¹⁴) that they forecast would typically provide at least 95 percent of the maximum weighted useable area¹⁵ for the priority species and limiting life-history stage present at that time. In some cases, other considerations took precedence over adherence to the 95 percent of maximum weighted useable area. These considerations included ensuring adequate flows for adult salmon migration at natural barriers, balancing overlapping life stages and species, preventing redd dewatering, considering the amount of inflow available at the upstream end of each reach, providing water to preserve the structural integrity of the South Canal,¹⁶ and assuming that accretions within the Keswick Reach upstream of the anadromous salmonid habitat would provide the necessary flows in the lower portion of this reach.

Another example of the use of conceptual model to screen solutions was the release of major cold water springs to the stream and the application of the SNTMP water temperature model to ensure that summer water temperatures were suitable for winter-run and spring-run chinook salmon under the “biologically optimum” flow regime.

The result of the solution identification process was a suite of proposed changes to the facilities and operations of the Battle Creek Hydroelectric Project (Table 3). This

¹⁴ The BCWG prefaced the use of the term “biologically-optimum.” That name was not intended to imply that these flows are “perfect” or that they provide the maximum potential amount of habitat. Rather, the term identified restored flows that were derived from the best Contemporary methodology for determining instream flows, that would minimize the take of habitat for listed species pursuant to Section 2081.0 of the California Fish and Game Code, and that would carefully balance overlapping ecological needs while recognizing the stated goal of maintaining stream-dependent economic values.

¹⁵ Pursuant to Section 2081.0 of the California Fish and Game Code, the taking of species, listed under the California Endangered Species Act, or their habitat, should be “minimized or fully mitigated.” In this case, releasing flows that provided 95 percent of the maximum weighted useable area was considered to “minimize” the take of habitat for listed species.

¹⁶ The MOU, written after these analyses, called for decommissioning of this canal.

project solution is referred to in this document as the “Restoration Project” and is supported by and described in detail in the June 1999 MOU signed by the NMFS, USBR, USFWS, CDFG, and PG&E.

Site Name	Component
North Battle Creek Feeder Diversion	55 cfs fish screen Fish ladder
Eagle Canyon Diversion	70 cfs fish screen Fish ladder
Wildcat Diversion	Dam and appurtenant facilities removed
South Diversion	Dam and appurtenant facilities removed
Inskip Diversion and South Powerhouse	220 cfs fish screen Fish ladder South Powerhouse and Inskip Canal connector
Coleman Diversion and Inskip Powerhouse	Dam removed 340 cfs fish screen Fish ladder
Lower Ripley Creek Diversion	Dam and appurtenant facilities removed
Soap Creek Diversion	Dam and appurtenant facilities removed

Finally, many of the goals and objectives of both the CALFED ERP and the CVPIA AFRP were included within the MOU. The CVPIA is a federal statute jointly implemented by the USBR and USFWS. Its goals are consistent with CALFED’s ERP. The CVPIA authorizes a number of projects and programs that contribute to the purposes of the Act and that are consistent with the restoration approach identified in the record of decision for CALFED. In Battle Creek, both CVPIA and CALFED plans, goals, funds, and projects have been utilized to benefit the ecosystem (CALFED 2001).

I.D.4. Step 4: Specification of Criteria of Success

The fourth step in formalized passive adaptive management is to specify criteria of success or failure of the most promising management solution (Table 2; Healey 2001). To make Adaptive Management scientifically feasible in the restoration of Battle Creek, consideration of the “success or failure of the Restoration Project” was divided among a series of individual objectives that closely correspond to the detailed description of the management problem as discussed above. Therefore, the success or failure of the Restoration Project will be measured against many indicators and criteria as described in detail within the eleven Adaptive Management objectives (see page 33).

Criteria vary among the different Adaptive Management objectives and are quite diverse. For example, Salmon and Steelhead Population Objective 1 (Spawning and Juvenile Production; page 43) uses the following metrics and criteria to gauge the success or failure of obtaining this objective:

Draft Adaptive Management Plan

Fish Population Objective 1 Metrics:

- Estimates of juvenile outmigrant production upstream of the CNFH and at the terminus of each fork of the creek;
- Estimates of adult and jack population sizes and distribution;
- Evaluations of physical and biological conditions within habitats by reach;

Fish Population Objective 1 Criteria:

- Estimates of juvenile outmigrant production will be compared to (1) expected production levels based on adult spawning populations, (2) production levels in Reference Watersheds, and (3) relevant ecological factors.

On the other hand, Salmon and Steelhead Habitat Objective 2 (Water Temperature, page 49) uses the following metrics and criteria to gauge the success or failure of obtaining this objective:

Habitat Objective 2 Metrics:

- Climatic conditions within the South Fork watershed;
- Longitudinal water temperature regime of stream;
- Flow at springs to which CDFG has conservation water rights;

Habitat Objective 2 Criteria:

- Observed water temperature regimes will be compared to water temperatures predicted by the best available Contemporary water temperature models at target points within the stream.

Please refer to individual population, habitat, and fish passage objectives for a complete understanding of the diverse criteria that will be used to gauge the success of the Restoration Project.

I.D.5. Step 5: Solution Implementation

The fifth step in formalized passive adaptive management is to implement the most promising solution and monitor the system response according to the criteria developed in Step 4 (Table 2; Healey 2001). The MOU among the MOU Parties described in detail what was considered to be the most promising solution. The USBR has proposed the suite of actions outlined in the MOU as the “preferred alternative” and may implement this solution, pending analysis in a formal NEPA/CEQA project selection process and pending receipt of necessary construction permits. A suite of monitoring studies and reporting protocols will be the basis for implementing this AMP (see Section VI, Appendix Listing AMP Monitoring Activities).

I.D.6. Step 6: Adaptive Responses

The sixth step in formalized passive adaptive management is to adjust the design of the solution from time to time according to the results of monitoring in an attempt to make it work better (Table 2; Healey 2001). As described in more detail below (see

page 31), adaptive responses are an integral feature of this AMP. The solution, as implemented in the form of the Restoration Project and considered under the structure of the eleven Adaptive Management objectives, will be evaluated to determine if each objective is being met and whether current actions should continue or if new actions are needed to meet the objectives. Adaptive Management responses could include any major or minor changes to the hydroelectric facility or the natural features of the Restoration Project. Adaptive Management responses have limits identified by the FERC license amendment. Adaptive Management responses falling outside those allowed by the FERC license amendment provisions would need to be addressed through established FERC processes.

I.E. Experimentation

Adaptive management is strongly rooted in scientific experimentation. By specifically designing experiments into management actions, conclusions can be drawn that help develop better resource management decision making. Experimentation in Battle Creek is embodied in three ways, where experimentation (1) has been a component of adaptive management problem definition and solution development, (2) is embodied in the overall Adaptive Management program as envisioned in this document, and (3) may be conducted as part of individual Adaptive Management objectives considered under this plan within the established protocols.

I.E.1. Experimentation in Problem Definition and Solution Development

Some early management actions functioned as experiments that helped to develop better resource management decision making in Battle Creek although they were not specifically designed as adaptive management experiments. For instance, during the period from 1985 to 1989, fall-run chinook were intentionally allowed passage over the CNFH barrier dam, below which they had historically been restricted, and instream flows were increased in the area accessible to these fish to assess their use of the habitat upstream of the CNFH. The major conclusions of this experiment were findings that fall-run chinook would use habitat as far upstream as the Inskip reach and that the presence of fall-run chinook in the water supply upstream of the CNFH contributed to subsequent disease outbreaks at the hatchery. This experimentation contributed to the development of improved disease control systems at the CNFH and contributed to the design of new water conveyance facilities that will partially isolate the CNFH water supply as part of the Restoration Project.

A similar management initiative in the late 1990s has also led to adaptive changes in the management of Battle Creek, specifically the development of new instream flow prescriptions as part of the Restoration Project. In 1995, a partnership between PG&E, state and federal fisheries agencies, and restoration funding sources (CVPIA and Category III) initiated increases in instream flows at half of the hydroelectric diversions affecting salmon and steelhead within Battle Creek while maintaining FERC-required minimum instream flows at the remainder of the diversions. Physical (e.g., water temperature, fish passage at natural barriers) and biological responses (e.g., fish

Draft Adaptive Management Plan

distribution) to these flow changes have been monitored and resulting observations have been incorporated into subsequent restoration planning.

I.E.2. Experimentation in the Overall Adaptive Management Effort

This AMP does not specify conducting individual experiments at this time. The intent of the MOU parties was to spend, if necessary, the limited funds available for Adaptive Management on implementing specific remedies to unforeseen shortcomings in the Restoration Project, rather than committing these funds to experimentation for goals other than those specific to the Restoration Project. The Adaptive Management Parties recognize the uncertainty surrounding our understanding of ecological processes and, specifically, about how salmon and steelhead populations will respond to initial Restoration Project actions. However, the Parties recognize that clear-cut population level responses may take decades to be manifested and trust in the considerable existing knowledge of the aquatic ecosystems of Battle Creek as well as the protocols for adaptive responses discussed in this AMP.

Collectively, the Restoration Project and the objectives set forth within this AMP constitute a long-term experiment in restoration. Theories of experimental design suggest that maximizing the difference between the treatment and control provides the best opportunity for identifying a response. In Battle Creek, the difference between the experimental control (existing conditions under the current FERC license) and the experimental treatment (Restoration Project actions) are so large that a response to these measures should become evident, provided that freshwater habitat conditions in the hydroelectric project reaches indeed limit fish production. For example, existing conditions under the current FERC license are typified by hydroelectric diversions with inadequate fish passage and instream flows that are very low for the target species' life stage needs, while the Restoration Project provides for removal of diversion dams, installation of state-of-the-art fish ladders and screens, protection against false attraction, release of major cold-water springs, and instream flow levels on the order of 10 to 29 times greater than existing conditions. Furthermore, the Restoration Project was specifically designed to minimize the uncertainty that is normally explored through experimentation. For example, installation of tailrace connectors should virtually eliminate the current transbasin water diversions that could otherwise lead to false attraction and confound the relationships between fish production and the other Restoration Project actions. Dam removals and increasing instream flows to levels approaching natural conditions are other examples of minimizing uncertainty.

Should the population objectives not be realized as a result of the Restoration Project and this AMP, then adaptive management suggests that other management actions be considered. Fortunately, the time scales of salmon and steelhead restoration (dictated by ecological processes like the population dynamics of small populations and cycles in oceanographic productivity) match up with the time scales of hydroelectric project relicensing. Another opportunity, outside of this AMP, to implement broad-scale changes to the hydroelectric project will be available in 2026 when the project is scheduled for relicensing and this AMP expires.

I.E.3. Experimentation Within Component Objectives

Though not specifically considered at this time, smaller-scale experiments may be a key tool for eliminating future uncertainty in the case that Adaptive Management responses are triggered by unforeseen future conditions. Several component objectives within this AMP specify that diagnostic studies will be performed in the case that planned management actions fail to achieve the intended objectives. Nothing in this AMP suggests that these diagnostic studies could not take the form of experimentation, provided they are feasible, practical, reasonable, prudent, acceptable to the local community, conform to required protocols, and fall within response limits that are specified in criteria that bound potential adaptive management responses.

I.F. Definitions

Adaptive Management means an approach that allows for changes to the Restoration Project that may be necessary in light of new scientific information regarding the biological effectiveness of the restoration measures.¹⁷

Adaptive Management Fund means the fund described in Section II.C.3.

Authorized Modifications means changes to project facilities and/or flow operations that are determined to be necessary per Adaptive Management protocols.

Battle Creek Watershed Conservancy (BCWC) means an organization of landowners from the Battle Creek watershed created as a means of discussing matters of concern to local landowners, including education, watershed land and water use, solid waste management, exotic vegetation control, and fire safety, and as a means of sharing information among watershed residents about the salmon and steelhead restoration plans under development by state and federal agencies.

Battle Creek Working Group means a stakeholder and agency group comprised of nearly 20 organizations interested in restoration of salmon and steelhead to Battle Creek (see Ward and Kier 1999a for a list of member organizations).

Battle Creek Hydroelectric Project, FERC Project No. 1121 or FERC Project No. 1121 means the hydroelectric development as described in the license issued by FERC on August 13, 1976, and as subsequently amended.

Consensus means the unanimous agreement among the Parties.¹⁸

Contemporary means current or modern. This word is generally used to refer to existing or future criteria that will be used to judge the success of restoration actions. When new criteria are created to replace old criteria, the use of “Contemporary” refers to the new criteria.

¹⁷ MOU 2.1

¹⁸ MOU 2.7

Draft Adaptive Management Plan

Emergency Responses are adaptive management responses that must be dealt with promptly (e.g., situations that create unsafe conditions or unduly threaten salmon or steelhead populations or individuals). Emergency Responses that require a change to hydroelectric project facilities and/or flow operations that exceed a value of \$100,000, adjusted for inflation from the date of this agreement, must be approved by the AMPT; otherwise they may be approved by the AMTT. The AMPT will treat the dollar amount listed in this paragraph as a flexible guideline, and will evaluate these numbers and revise them as necessary as part of the yearly report. Any member of the AMPT may propose an adjustment to these spending guidelines for any action.

Fail-Safe Fish Ladder means features inherent in the design of the ladder that ensure the structure will continue to operate to facilitate the safe passage of fish under the same performance criteria as designed under anticipated possible sources of failure.¹⁹

Fail-Safe Fish Screen means a fish screen that is designed to automatically shut off the water diversion whenever the fish screen fails to meet design or performance criteria until the fish screen is functioning again.²⁰

Licensee means either PG&E or any lessee or successor owner of FERC Project No. 1121.

Licensee's Commitment means a total spending cap on the part of the Licensee for expenses necessary under Adaptive Management. As more specifically identified in Section II.C.4. in the event of exhaustion of the WAF and AMF, Licensee acknowledges and agrees that it will pay up to a total of \$6,000,000 for all Authorized Modifications to FERC Project No. 1121 facilities and/or flow operations that are determined to be necessary under Adaptive Management.

Major Responses are defined as non-emergency changes to hydroelectric project facilities and/or flow operations that exceed a value of \$25,000, adjusted for inflation from the date of this agreement. The AMPT will treat the dollar amount listed in this paragraph as a flexible guideline, and will evaluate these numbers and revise them as necessary as part of the yearly report. Any member of the AMPT may propose an adjustment to these spending guidelines for any action.

Minor Responses are defined as non-emergency changes to hydroelectric project facilities and/or flow operations that are less than a value of \$25,000, adjusted for inflation from the date of this agreement. The AMPT will treat the dollar amount listed in this paragraph as a flexible guideline, and will evaluate these numbers and revise them as necessary as part of the yearly report. Any member of the AMPT may propose an adjustment to these spending guidelines for any action.

Parties means PG&E (or any lessee or successor), NMFS, USFWS, and CDFG.²¹

¹⁹ MOU 2.10

²⁰ MOU 2.11

PG&E means “the Pacific Gas and Electric Company,”²² the utility regulated by the California Public Utility Commission that owned the Battle Creek Hydroelectric Project (FERC Project No. 1121) at the time this document was prepared. (The term “PG&E” as used in the MOU and the use of PG&E is continued in this document for the ease of the reader.) “PG&E” and “Licensee” refers to the Pacific Gas and Electric Company or any lessee or successor owner of FERC Project No. 1121.

Ramping Rates means moderating the rate of change of stream stage decrease in Battle Creek resulting from the operation of FERC Project No. 1121.²³

Reference Watersheds means the Deer, Mill, and Butte Creek watersheds and any other watersheds resembling Battle Creek in geology, morphology, hydrology, and fish species diversity and distribution, that are located in proximity to Battle Creek.

Resource Agencies means the CDFG, NMFS, and USFWS.²⁴

Restoration Project means all measures set forth in the Agreement in Principle (MOU Attachment 1) as further developed in the MOU and having the purpose of restoring chinook salmon and steelhead habitat associated with FERC Project No. 1121, within the Restoration Project Area.²⁵

Restoration Project Area means the areas in and around the following PG&E facilities: Coleman Diversion Dam, Inskip Diversion Dam, South Diversion Dam, Wildcat Diversion Dam, Eagle Canyon Diversion Dam, North Battle Creek Feeder Diversion Dam, and Asbury Pump Diversion Dam; Battle Creek, North Fork Battle Creek and South Fork Battle Creek, up to the natural barriers at 14 miles and 19 miles above the confluence, respectively; and Eagle Canyon Springs, Soap Creek (and Bluff Springs), Baldwin Creek, Lower Ripley Creek, and each of their adjacent water bodies.²⁶

Viable Salmonid Population means an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame. Other processes contributing to extinction risk (catastrophes and large-scale environmental variation) are also important considerations, but by their nature, they need to be assessed at the larger temporal and spatial scales represented by evolutionarily significant units or other entire collections of populations.⁶⁹

Water Acquisition, funded by WAF, AMF, Licensee, and others, means the non-consumptive release of water from use in FERC Project No. 1121 to the natural stream channel as instream flows. Payments for additional water acquisition during the first ten

²¹ The Parties, as used in this document, differs from the MOU parties in that it does not include the USBR, whose only role in Adaptive Management is to maintain the WAF account and disburse monies at the request of the AMPT through the USFWS.

²² Part of MOU 2.14

²³ MOU 2.16

²⁴ MOU 2.17

²⁵ MOU 2.18

²⁶ MOU 2.19

Draft Adaptive Management Plan

years of the Restoration Project are made from the WAF in arrears annually to the Licensee. For additional water that will continue to be released beyond the ten-year life of the WAF, a lump-sum payment computed on the net present value of the ongoing water release will be paid at the end of the tenth year. Water acquisition does not impact the consumptive use of water downstream from the Restoration Project Area.

II. ORGANIZATION

As required by the MOU, the AMP was developed through the Consensus process by the Resource Agencies and Licensee. Interested persons were invited to attend any meeting, contribute to discussions and provide suggestions regarding development of the AMP. Specific notice, in addition to any general notice, of any such meetings was sent to (1) the BCWC; (2) CALFED; and (3) any person who requested such notification.²⁷

II.A. Structure

The basic organizational structure of the Adaptive Management effort consists of the Adaptive Management Policy Team²⁸ (AMPT) and the Adaptive Management Technical Team²⁹ (AMTT).

II.A.1. Adaptive Management Policy Team

The AMPT is a management-level cooperative group that makes all final decisions regarding the implementation of the Adaptive Management component of the Restoration Project. The AMPT has a representative from each of the Resource Agencies and Licensee. The members of the AMPT are familiar with Adaptive Management methodologies adopted by CALFED.

The AMPT provides policy direction and resolves any disputes forwarded by the AMTT through Consensus. In the event that the AMPT is unable to reach Consensus within 30 days, dispute resolution procedures, described herein, shall be followed.³⁰

II.A.2. Adaptive Management Technical Team

Voting members of the AMTT include a representative from each of the Resource Agencies and Licensee with appropriate training and experience to effectively address the technical aspects of implementing the AMP.³¹ While each Party will have only one voting member, more than one individual from each Party will likely serve on the AMTT during the term of the AMP in order to effectively address the technical aspects of AMP implementation.

²⁷ MOU 9.1.A.1.

²⁸ MOU 9.1.B.1

²⁹ MOU 9.1.B.

³⁰ MOU 9.1.B.1

³¹ MOU 9.1.B.2

The AMTT has developed the AMP for approval by the AMPT and will implement the Adaptive Management component of the Restoration Project upon approval by FERC. The Chairperson of the AMTT will rotate regularly as agreed upon by the AMTT.³²

II.B. Roles and Responsibilities

The MOU lists the roles and responsibilities for each party to the MOU pertaining to the overall Restoration Project as well as the those roles and responsibilities for Adaptive Management. The following sections of this AMP list only those roles and responsibilities that pertain to Adaptive Management. See the MOU for a more complete list. The AMP sets policy regarding roles and responsibilities when not specifically addressed by the MOU. However, in cases where the language in the AMP may conflict with the MOU, roles and responsibilities will be set by the MOU. The MOU prevails in any discrepancy between the AMP and the MOU.

II.B.1. Licensee

- A. As more fully described below, Licensee has agreed to a number of physical and operational changes and additions to FERC Project No. 1121, as well as the assumption of a number of future costs. Licensee, however, recognizes that these costs may exceed those estimates and agrees it is responsible for all cost overruns for Restoration Project components which are identified as funded by Licensee in Table 3 of MOU Attachment 1. This amount includes Licensee's participation in a portion of the biological and environmental monitoring more fully described in MOU Section 7.3. In addition to other financial obligations documented in the MOU and Facilities Monitoring Plan, Licensee's financial participation in the Adaptive Management elements of the Restoration Project will consist of absorption of the loss of forgone power as a consequence of Ramping Rate requirements described in MOU Attachment 2. In the event of exhaustion of the WAF and AMF, Licensee acknowledges and agrees that it will pay up to a total of \$6,000,000 for all Authorized Modifications to FERC Project No. 1121 facilities and/or flow operations which are determined to be necessary under Adaptive Management. No aspect of this commitment relieves the Licensee from legal responsibilities. Nothing in the AMP is intended to bind or prejudice the Resource Agencies, or otherwise limit their respective authorities, in the performance of their responsibilities under this AMP, the MOU, and other applicable federal and state laws.³³
- B. Licensee will pay all of its internal costs associated with the FERC license amendment required to implement the Restoration Project. Licensee will also participate in and provide limited internal technical and fishery expertise, at its

³² MOU 9.1.B.2

³³ MOU 6.1A

Draft Adaptive Management Plan

expense, to assist with the biological and environmental monitoring efforts described in Section 7.3 and will cooperate/work with the Resource Agencies conducting analyses, reviewing results, and identifying potential Adaptive Management actions for the Restoration Project.³⁴

- C. Licensee will provide the prescribed instream flow releases and Ramping Rates identified in MOU Attachments 1 and 2, and any agreed-upon future changes to these prescribed instream flow releases or Ramping Rates resulting from the AMP until the end of the current FERC license and any subsequent annual licenses. The Parties acknowledge that this commitment to provide the prescribed instream flow releases and Ramping Rates is subject to change by FERC in the license amendment process and at the expiration of the current license term in 2026.³⁵
- D. Licensee's water diversion rights associated with all dams to be decommissioned in the Restoration Project Area pursuant to the MOU shall be transferred to CDFG. CDFG agrees that the water rights transferred by Licensee to CDFG shall not be used by CDFG or any successor in interest, assignee, or designee to increase prescribed instream flow releases above the amounts developed pursuant to the AMP, nor shall they be used adversely against remaining FERC Project No. 1121 upstream or downstream diversions, until such time as the FERC license is abandoned, whereupon the limitation regarding transferred water rights will no longer apply. Licensee agrees that its riparian rights associated with lands within the Restoration Project Area shall not be used by Licensee or any successor in interest, assignee, or designee to decrease prescribed instream flow releases below the amounts developed pursuant to the AMP. Licensee agrees that any deed transferring such riparian land or rights shall contain the above restriction in use of the riparian rights.³⁶
- E. Licensee is responsible for the operation, maintenance, and replacement of all physical modifications to its facilities under this MOU on Battle Creek due to normal wear and tear, catastrophic damage, and any other type of damage, and will ensure that the new fish screen and ladder facilities meet the Fail-Safe criteria. Installation costs of facilities installed under the AMF protocols are excepted. Licensee's responsibilities under this section begin once the facility start-up and acceptance testing is successfully completed by USBR and Licensee. At that point, Licensee shall accept and take over the facilities.³⁷
- F. Licensee shall be responsible for all monitoring required by FERC through the FERC license amendment for FERC Project No. 1121. Licensee will also participate in and provide limited internal technical and fishery expertise, at its expense, to assist with the biological and environmental monitoring efforts

³⁴ MOU 6.1.B

³⁵ MOU 6.1.D

³⁶ MOU 6.1.E

³⁷ MOU 6.1.G

described in MOU Section 7.3, which are the responsibility of the Resource Agencies. Licensee shall be responsible for all of the facility monitoring more particularly described in the Facilities Monitoring Plan.³⁸

- G. Licensee shall provide at least one representative to the AMPT and one representative to the AMTT. Licensee's representatives to these two teams shall be responsible, for one year out of every four as outlined in the Protocols section, for the chairmanship of these teams on a rotating basis with the other Parties. These chairmanships includes the responsibility of publishing the annual Adaptive Management report.
- H. Licensee will be responsible for assuming its costs for any FERC dispute resolution proceedings.³⁹
- I. As described more fully below in descriptions of individual Adaptive Management objectives, Licensee shall conduct and/or fund facilities monitoring consistent with the Facilities Monitoring Plan, including recording the timing and estimated amounts of water intentionally released from the canal gates and spill channels; conduct and/or fund the facilities monitoring, and operation and maintenance of hydroelectric project facilities; conduct and/or fund adult counts at fish ladders in the initial three-year period of operation; repair or replace fish counting equipment in fish ladders in the initial three-year period of operation. Pursuant to Adaptive Management protocols, if salmon and steelhead populations are insufficient to affirm ladder effectiveness under continuous duty, then Licensee may conduct and/or fund adult counts at fish ladders for a longer period of time as agreed upon by the Parties. All data collected as part of Adaptive Management monitoring will conform to data management protocols in Section V.B.

II.B.2. NMFS

- A. In the next relicensing proceeding for FERC Project No. 1121, to the extent NMFS determines that these provisions are consistent with the biological opinion rendered for the proposed Restoration Project and its responsibilities under the ESA to conserve threatened and endangered species and their habitats,⁴⁰ the NMFS agrees to support the continuation of the prescribed instream flow releases described in MOU Attachment 1 and Ramping Rates resulting from adaptive management.⁴¹
- B. NMFS agrees to support, to the extent NMFS determines that these provisions are consistent with the biological opinion rendered for the proposed Restoration Project and its responsibilities under the ESA to conserve

³⁸ MOU 6.1.M

³⁹ MOU 14.0

⁴⁰ MOU 6.3.B

⁴¹ MOU 6.3.B.3

Draft Adaptive Management Plan

threatened and endangered species and their habitats, any changes to instream flow releases or Ramping Rates resulting from Adaptive Management, subject to applicable law, and to support incorporating Battle Creek monitoring needs into appropriate CVPIA, CALFED, and other monitoring programs.⁴²

- C. NMFS shall provide at least one representative to the AMPT and one representative to the AMTT. NMFS's representatives to these two teams shall be responsible, for one year out of every four as outlined in the Protocols section, for the chairmanship of these teams on a rotating basis with the other Parties. These chairmanships includes the responsibility of publishing the annual Adaptive Management report.
- D. NMFS will be responsible for assuming its costs for any FERC dispute resolution proceedings.⁴³
- E. As described more fully below in descriptions of individual Adaptive Management objectives, NMFS, in cooperation with USFWS and CDFG, may conduct and/or fund or seek funding from sources other than the Licensee for any necessary unfunded element of Adaptive Management. All data collected as part of Adaptive Management monitoring will conform to data management protocols in Section V.B.
- F. NMFS will define recovery goals for anadromous salmonid species in Battle Creek listed under the ESA. These include species currently listed (i.e., winter-run chinook salmon, spring-run chinook salmon, and steelhead) as well as any other anadromous fish species that may be listed under the ESA at any time during the term of the AMP.

II.B.3. USFWS

- A. In the next relicensing proceeding for FERC Project No. 1121, USFWS agrees to support the continuation of the prescribed instream flow releases described in MOU Attachment 1 and Ramping Rates resulting from adaptive management.⁴⁴
- B. USFWS agrees to support any changes to instream flow releases or Ramping Rates resulting from Adaptive Management, subject to applicable law, and to support incorporating Battle Creek monitoring needs into appropriate CVPIA, CALFED, and other monitoring programs.⁴⁵
- C. USFWS shall provide at least one representative to the AMPT and one representative to the AMTT. USFWS's representatives to these two teams shall be responsible, for one year out of every four as outlined in the Protocols

⁴² MOU 6.3.C

⁴³ MOU 14.0

⁴⁴ MOU 6.4.B.3

⁴⁵ MOU 6.4.C

section, for the chairmanship of these teams on a rotating basis with the other Parties. These chairmanships includes the responsibility of publishing the annual Adaptive Management report.

- D. USFWS will be responsible for assuming its costs for any FERC dispute resolution proceedings.⁴⁶
- E. As described more fully below in descriptions of individual Adaptive Management objectives, USFWS, in cooperation with CDFG and NMFS, shall conduct and/or fund or seek funding from sources other than the Licensee for monitoring and data assessments including those associated with all fish population objectives; data collection and report preparation associated with Habitat Objective 1; water temperature and climatic data collection associated with Habitat Objective 2; relevant biological monitoring and measurement of any known release or discharge from the hydropower water conveyance system that elicits a response from salmon or steelhead associated with Habitat Objective 3; incidental monitoring and the diagnostic Ramping Rate assessment associated with Habitat Objective 4; biological monitoring using ladder counts after the ladder is deemed effective associated with Passage Objective 1; the repair or replacement of fish counting equipment in fish ladders after the initial three-year period of operation; and monitoring activities associated with Passage Objective 3. All data collected as part of Adaptive Management monitoring will conform to data management protocols in Section V.B.

II.B.4. CDFG

- A. In the next relicensing proceeding for FERC Project No. 1121, CDFG agrees to support the continuation of the prescribed instream flow releases described in MOU Attachment 1 and Ramping Rates resulting from adaptive management.⁴⁷
- B. CDFG agrees to support any changes to instream flow releases or Ramping Rates resulting from Adaptive Management, subject to applicable law, and to support incorporating Battle Creek monitoring needs into appropriate CVPIA, CALFED, and other monitoring programs.⁴⁸
- C. CDFG shall provide at least one representative to the AMPT and one representative to the AMTT. CDFG's representatives to these two teams shall be responsible, for one year out of every four as outlined in the Protocols section, for the chairmanship of these teams on a rotating basis with the other Parties. These chairmanships includes the responsibility of publishing the annual Adaptive Management report.

⁴⁶ MOU 14.0

⁴⁷ MOU 6.5.C.3

⁴⁸ MOU 6.5.D

Draft Adaptive Management Plan

- D. CDFG will be responsible for assuming its costs for any FERC dispute resolution proceedings.⁴⁹
- E. As described more fully below in descriptions of individual Adaptive Management objectives, CDFG, in cooperation with USFWS and NMFS, shall conduct and/or fund or seek funding from sources other than the Licensee for monitoring and data assessments including those associated with all fish population objectives; data collection and report preparation associated with Habitat Objective 1; water temperature and climatic data collection associated with Habitat Objective 2; relevant biological monitoring and measurement of any known release or discharge from the hydropower water conveyance system that elicits a response from salmon or steelhead associated with Habitat Objective 3; incidental monitoring and the diagnostic Ramping Rate assessment associated with Habitat Objective 4; biological monitoring using ladder counts after the ladder is deemed effective associated with Passage Objective 1; the repair or replacement of fish counting equipment in fish ladders after the initial three-year period of operation; monitoring activities associated with Passage Objective 3; modification of natural fish passage barriers. All data collected as part of adaptive Management Monitoring will conform to data management protocols in Section V.B.

II.C. Funding

Funding for provisions of this AMP will come from several sources including a WAF and AMF, both initially described in the MOU, cost sharing by the Parties, and solicitations from other funding sources. No provisions in the MOU or the following sections on funding are intended to limit the ability of the Parties, or third-party donors, from augmenting the Adaptive Management budget to continue to implement actions supported by AMP protocols.

II.C.1. CALFED Monitoring Fund

As part of the original grant for the Restoration Project, CALFED included \$1,000,000 for monitoring activities. This money will be used to fund monitoring needs that are not funded by other sources.

II.C.2. Water Acquisition Fund

An important component of the Restoration Project will be the WAF. The purpose of the WAF is to establish a ready source of money which may be needed for future purchases of additional instream flow releases in Battle Creek that may be recommended under the AMP during the ten-year period following the initiation of prescribed instream flow releases listed in MOU Attachment 1. The WAF shall be used solely for purposes of purchasing additional environmentally-beneficial instream flow

⁴⁹ MOU 14.0

releases pursuant to the protocols developed by the Resource Agencies and Licensee. The Parties acknowledge that if additional instream flow releases are determined by the Resource Agencies to be required pursuant to the protocols described in MOU Section 9.2 A 3, the ESA, or other applicable law, and (1) the ten-year period described above has elapsed and/or (2) there are not sufficient funds in the WAF or the AMF to pay for such additional instream flow releases, then Licensee shall be responsible for the cost of such instream flow releases up to the maximum commitment of \$6 million for changes in operation and modifications to facilities.⁵⁰

The WAF account will be funded with federal funds described in Section 10.2 of the MOU and administered by the Resource Agencies following consultation with appropriate interested parties. USBR shall commit \$3,000,000 of such funds to an account or subaccount for the WAF within four months of CALFED approval of federal funds described in MOU Section 10.2. Account disbursement instructions will be developed jointly by the Resource Agencies and Licensee. USFWS shall request disbursements from the WAF in writing, based on the account disbursement instructions.⁵¹

Protocols to identify environmentally beneficial flow changes for anadromous salmonids under the AMP, to be funded from the WAF, are detailed in a subsequent section of this plan.

During the ten-year effective period of the WAF, payment to Licensee for consensually agreed to or FERC-approved increased flow releases, and interim instream flow releases which have been taken pending FERC action, will be made in arrears annually. After January 1 following the expiration of the WAF, all uncommitted funds will revert to CALFED, or as otherwise provided by law. During the last year of the WAF, and to the extent that adequate moneys remain in the WAF, funds for agreed to prescribed instream flow releases which will be delivered after expiration of the WAF will be paid to Licensee in one lump-sum based on the net present value of foregone energy for the period inclusive of the realized increased prescribed instream flow releases and expiration date of the current FERC license.

The method of valuation of any additional environmentally beneficial prescribed instream flow releases for the purpose of compensation from the WAF shall be similar to that used for estimating the net present value of foregone power in MOU Attachment 1. The annual in arrears payments described above will be calculated by computing the additional energy foregone on a daily basis over the prior year due to increased prescribed instream flow releases multiplied by the weighted daily energy price published by the California Power Exchange for northern California, or equivalent. The lump-sum payment described above will be determined based on the average annual additional foregone energy associated with increased prescribed instream flow releases for a typical

⁵⁰ Based on MOU 9.2.A.1 and subsequent discussions.

⁵¹ MOU 9.2.A.2

Draft Adaptive Management Plan

water year (e.g., water year 1989). The net present value payment will be based on the appropriate power values, escalation factor, and discount rate.⁵²

Section 9.2.A.4 of the MOU provides for the calculation of a net present value payment from Adaptive Management funds at the end of year 10 for continuing additional instream flows determined necessary under Adaptive Management protocols. This section, however, left undetermined the actual power values; escalation factors, and discount rate to be used in such a calculation. These variables were left undetermined because the Adaptive Management Parties recognized that the conditions under which these variables were defined during negotiations were likely to change (perhaps significantly) between the finalization of the MOU and the end of the ten-year effective period of the WAF.

Residential and industrial demand, available supply, and available access via transmission and distribution systems will impact future power values. The future power values used in MOU negotiations were based on projections of the California energy market by the California Energy Commission (CEC). If the CEC is still developing similar projections when the WAF is accessed for the year 10 lump-sum net present value payment, their estimates will be used. In the event that the CEC no longer exists, or they no longer develop such projections, an impartial set of projections will need to be used. The first preference is to use projections developed by another State of California agency that has responsibility for developing published projections. If no such agency exists, the Parties will agree to an appropriate substitute through Adaptive Management decision-making protocols.

The previous paragraph assumes that the hydroelectric project will be participating in a deregulated energy market. In the event that the hydroelectric project is regulated by the California Public Utilities Commission, replacement power value and discount rate appropriate to the regulated utility status would be used by the Parties in arriving at a lump-sum net present value payment.

Escalation (or inflation) factors will be agreed upon by the Parties through Adaptive Management decision-making protocols.

During negotiation of the MOU, the electric generation industry in California was transitioning from a regulated industry to a deregulated industry. At the end of the ten-year effective period of the WAF, when funds for agreed to prescribed instream flow releases will be paid to Licensee in one lump-sum, the electric generation industry may be completely deregulated. The discount rate used was based on PG&E's weighted average cost of capital. This discount rate was justified due to PG&E's regulated utility status, more specifically, the cost-of-service regulation of its hydroelectric generation assets. The Licensee may or may not have this status at the end of the ten-year effective period of the WAF. As a fully deregulated industry, the appropriate discount rate would be based on the expected return by the Licensee in the deregulated industry. It is not clear what such a discount rate will be at the end of the ten-year period.

⁵² MOU 9.2.A.4

Keeping the previous paragraph in mind, the discount rate should be applicable to the Licensee and agreed upon by the Parties through Adaptive Management decision-making protocols.

II.C.3. Adaptive Management Fund

Another component of the Restoration Project will be the AMF to implement actions developed under the AMP. The Parties agree that the purpose of the AMF is to provide a readily available source of money to be used for possible future changes in the Restoration Project. The AMF shall be used only for Restoration Project purposes directly associated with FERC Project No. 1121 including compensation for prescribed instream flow release increases after the exhaustion or termination of the WAF. The AMF shall be administered pursuant to the AMP protocols. The AMF shall not be used to fund monitoring or construction cost overruns.⁵³

The AMF, in the amount of \$3,000,000, will be made available to Licensee and the Resource Agencies by the Packard Foundation, to fund those actions developed pursuant to the AMP. The Packard Foundation shall deposit the \$3,000,000 in an interest-bearing account managed by The Nature Conservancy (TNC) pursuant to a separate agreement to be developed jointly by the Resource Agencies, Licensee, and TNC. Account disbursement instruction will be developed jointly by the Resource Agencies, the Packard Foundation, and Licensee.

The Parties agree that (1) interest on the moneys in the AMF will accrue to the account and shall be applied to changes in the Restoration Project adopted pursuant to the Adaptive Management protocols and (2) all uncommitted funds in the AMF will revert to the Packard Foundation at the end of the current term of the license for FERC Project No. 1121. USFWS shall request disbursement from the AMF in writing, based on the protocols identified below.⁵⁴

Protocols to designate environmentally beneficial Adaptive Management actions to be funded from the AMF pursuant to the AMP, are detailed in a subsequent section of this plan.

For funding prescribed instream flow increases, the protocols will be the same as for the WAF described in MOU Section 9.2 A 3. For funding facility modification, the protocols will be the same as that described in MOU Section 9.2 A 3, with two exceptions: (1) no interim action will be implemented prior to any required FERC approval of a license amendment or other necessary action by FERC and (2) for all actions resolved by FERC, in which Licensee is in the minority opinion (opposing a proposed action expenditure), the AMF will contribute 60 percent of any resulting facility modification cost; in the case of Licensee being in the majority opinion (in support of a

⁵³ MOU 9.2.B.1

⁵⁴ MOU 9.2.B.2

Draft Adaptive Management Plan

proposed action expenditure), the AMF will contribute 100 percent of any resulting facility modifications.⁵⁵

II.C.4. Licensee Commitment

The principles of Adaptive Management include agreed-upon measures to ensure resources are not expended on an open-ended process of change that is out of proportion with the specified goal. While this level of detail was not addressed in the MOU, in the development of this AMP measures were more specifically defined, resulting in a funding commitment on the part of the Licensee in the amount of \$6 million for continuation of Adaptive Management actions after exhaustion of the WAF and AMP. In aggregate, the funding commitments will provide up to \$12 million for Adaptive Management actions over the life of the Restoration Project.

In the event of exhaustion of the WAF and AMF, Licensee acknowledges and agrees that it will pay up to a total of \$6,000,000 for all Authorized Modifications to FERC Project No. 1121 facilities and/or flow operations which are determined to be necessary under Adaptive Management.⁵⁶ No aspect of this commitment relieves the Licensee from legal responsibilities. Nothing in the AMP is intended to bind or prejudice the Resource Agencies, or otherwise limit their respective authorities, in the performance of their responsibilities under this AMP, the MOU, and other applicable federal and state laws.⁵⁷

This commitment is intended to provide a readily available source of money to be used for possible future changes in the Restoration Project.⁵⁸ This commitment shall be used only for Restoration Project purposes directly associated with FERC Project No. 1121 including compensation for prescribed instream flow release increases after the exhaustion or termination of the WAF and after the exhaustion or termination of the AMF.⁵⁹ This commitment shall be administered pursuant to the AMP protocols and shall not be used to fund monitoring or construction cost overruns.⁶⁰ Furthermore, this commitment may fund future purchases of additional instream flow releases in Battle Creek which may be recommended under the AMP.⁶¹

II.D. Term

The term of the AMP will begin when the FERC license amendment for the Restoration Project is granted, will coincide with the implementation of restoration actions, and will continue through the current FERC license. In addition, the AMP also

⁵⁵ MOU 9.2.B.3

⁵⁶ Parallels MOU 6.1.A

⁵⁷ MOU 5.7

⁵⁸ Parallels MOU 9.2.A.1

⁵⁹ Parallels MOU 9.2.B.1

⁶⁰ Parallels MOU 9.2.B.1

⁶¹ Parallels MOU 9.2.A.1

includes more specific end points for some objectives, monitoring approaches, or responses.

II.D.1. Water Acquisition Fund

The WAF is available as a ready source of money for future purchases of additional instream flow releases in Battle Creek during the ten-year period following the initiation of prescribed instream flow releases listed in Attachment 1 of the MOU. After January 1 following the expiration of the WAF, all uncommitted funds will revert to CALFED, or as otherwise provided by law.⁶²

II.D.2. Adaptive Management Fund

Provisions for establishment and administration of the interest-bearing AMF account became effective December 1, 2000, with the execution of an agreement between TNC and the MOU parties. The AMF account will be established 30 days after receipt of a final FERC Order approving the FERC license amendment that reflects the provisions of the Restoration Project and Adaptive Management. To the extent it is not exhausted, this fund will remain in effect from that point through and including June 30, 2026, or any earlier date upon which the FERC License for FERC Project No. 1121 expires or is revoked, unless earlier terminated pursuant to the agreement between TNC and the MOU parties regarding the AMF.⁶³

II.D.3. FERC License

The license for the Battle Creek Hydroelectric Project, FERC Project No. 1121 was issued by FERC on August 13, 1976, and is scheduled to expire on July 31, 2026, unless extended by FERC.⁶⁴

III. ADAPTIVE MANAGEMENT OBJECTIVES

This technical chapter of the AMP describes specific Adaptive Management objectives pertaining to the future Adaptive Management of Restoration Project elements, and the scientific methodology associated with Adaptive Management of salmon and steelhead populations, habitat, and passage directly affected by the Restoration Project.

The focus of AMP objectives is on the management of salmon and steelhead habitat, and in particular, on hydroelectric project facilities and natural habitat features affected by hydroelectric project operations within the Restoration Project area. Although the Restoration Project Area includes the north and south forks of Battle Creek

⁶² Mimics MOU 9.2.A

⁶³ Per the May 7, 2000 agreement between TNC and the MOU Parties regarding the AMF.

⁶⁴ Mimics MOU 2.4 and MOU 15.0

Draft Adaptive Management Plan

upstream to the natural water falls,⁶⁵ no elements of the Restoration Project (i.e., neither facilities or operations of the FERC Project No. 1121 modified as part of the Restoration Project) will exist upstream of Inskip and North Battle Creek Feeder Diversion Dams. Therefore, adaptive management actions upstream of Inskip Dam and North Battle Feeder Dam will be limited to modification of any natural barriers that may occur up to, but not including, the absolute barriers to anadromous fish passage at the falls on each fork (river mile 18.85 on the South Fork and river mile 13.48 on the North Fork).⁶⁵

Central to the AMP focus on management of habitat is an implicit expectation that salmon and steelhead populations will respond affirmatively to positive changes in their habitat. During the term of the AMP, Restoration Project elements will change fish habitat with the intention of improving that habitat for chinook salmon and steelhead. The AMTT expects to be able to measure significant responses to these habitat changes from the larger populations of salmonids like steelhead and fall-run chinook salmon. However, statistically significant responses to these habitat changes in populations of fish that are currently at extremely low levels, such as winter-run chinook salmon, may not be measurable at least until the populations of these scarce fish grow. This is due to the small number of these fish, limited natural recovery rates, and the limitations of scientific and statistical tools. The ability to adaptively manage habitat features of Battle Creek based on measurements of scarce populations of winter-run chinook, and possibly spring-run chinook, will be severely constrained until such a time that populations levels of these species increase substantially. Adaptive Management actions will not be triggered by biological measurements of scarce species alone; rather, habitat trigger events will need to support the biological indicators. Currently there is not sufficient predictive capability to determine when full recovery of listed species may occur.

The AMP objectives are sufficiently flexible to respond to implementation of approved programs which may change the time scales that apply to fisheries monitoring. However, the AMP objectives do not include artificial propagation and/or supplementation and do not incorporate potential future fisheries management plans that could implement various kinds of artificial propagation and/or supplementation programs, because such programs are outside the scope of the Restoration Project. Likewise, the AMP objectives do not exclude artificial propagation and/or supplementation, activities that may be specified in future fisheries management plans. The AMP objective also do not address the possibility of future development within Battle Creek.

Eleven objectives were identified pertaining to the Adaptive Management of salmon and steelhead populations, habitat, and passage affected by the Restoration Project (Table 4). These objectives were developed primarily from MOU language and pertain to all reasonable and foreseeable interactions between modifications to FERC Project No. 1121 facilities and operations, and salmon and steelhead populations.

⁶⁵ MOU 2.19. The barriers which determine the upstream distribution of anadromous salmonids in Battle Creek at river mile 13.48 on the North Fork of Battle Creek and at river mile 18.85 on the South Fork will not be modified as part of this AMP.

The nature of adaptive management, by definition, is to design studies and management programs that can be adapted to uncertain or unforeseen circumstances. A well-designed adaptive management plan anticipates as many circumstances as possible before designing monitoring and data assessment approaches. Within the eleven objectives, circumstances or issues that were anticipated include potential limiting factors such as water temperature, habitat quantity based on instream flow, natural barriers, fish passage at diversion dams, problems with facility design or operation, and many more. However, this AMP recognizes that not all future limiting factors could be anticipated. Therefore, many of the objectives refer to future unanticipated factors which could conceivably include things such as institutional changes (e.g., changes to the ESA or other laws), new natural resource management directives (e.g., artificial propagation or supplementation programs), newly understood ecological phenomena (e.g., global climate change), or land and water use changes (e.g., suburbanification of the uplands). Some unanticipated factors may fall outside of the Restoration Project (e.g., toxic spills) and would be addressed through linkages to other programs or directives, while others might be shown to be related to the hydroelectric project or shortcomings in the Restoration Project that could arguably be included under these adaptive management

Table 4. Adaptive Management objectives of the Battle Creek Salmon and Steelhead Restoration Project.

Salmon and Steelhead Populations
<ol style="list-style-type: none"> 1. Ensure successful salmon and steelhead spawning and juvenile production. 2. Restore and recover the assemblage of anadromous salmonids (i.e., winter-run, spring-run, steelhead) that inhabit the stream’s cooler reaches during the dry season 3. Restore and recover the assemblage of anadromous salmonids (i.e., fall-run, late-fall-run) that enter the stream as adults in the wet season and spawn upon arrival. 4. Ensure salmon and steelhead fully utilize available habitat in a manner that benefits all life stages thereby maximizing natural production and full utilization of ecosystem carrying capacity
Salmon and Steelhead Habitat Objectives
<ol style="list-style-type: none"> 1. Maximize usable habitat quantity – volume. 2. Maximize usable habitat quantity – water temperature. 3. Minimize false attraction and harmful fluctuation in thermal and flow regimes due to planned outages or detectable leaks from the hydroelectric project 4. Minimize stranding or isolation of salmon and steelhead due to variations in flow regimes caused by hydroelectric project operations.
Salmon and Steelhead Passage Objectives
<ol style="list-style-type: none"> 1. Provide reliable upstream passage of salmon and steelhead adults at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams per Contemporary engineering criteria and/or standards/guidelines. 2. Provide reliable downstream passage of juveniles at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams per Contemporary criteria after the transfer of facilities to Licensee. 3. Provide reliable upstream passage of adult salmon and steelhead to their appropriate habitat over natural obstacles within the Restoration Project area while maintaining an appropriate level of spatial separation among the runs.

Draft Adaptive Management Plan

objectives (e.g., possible oligotrophication problems in Battle Creek⁶⁶). While this discussion of possible unanticipated factors may seem speculative or fanciful, past experience with adaptive management has shown that the actual factors that are eventually encountered will likely be even more surprising.

Adaptive Management used in this plan could more technically be defined as “passive” adaptive management, where changes in management are made in response to monitoring results, versus an “active” type of adaptive management where specific experiments are conducted in order to learn about ecological processes. Due to the existing knowledge regarding the aquatic ecosystems in Battle Creek, no specific experiments are contemplated. For example, this AMP does not consider experimental changes in instream flow designed to elucidate relationships between flow and salmonid habitat use.

III.A. Objective Table Format

In the following description of objectives and in the accompanying flow chart (Figure 4), the **bold-faced** terms refer to components of the Adaptive Management objective that will be discussed in more detail in the following sections and specifically within the tables detailing each objective.

For each **objective**, the Adaptive Management process will follow a stepwise scientific process beginning with a testable hypothesis which would indicate whether an objective is being met. **Hypotheses** conform to formal adaptive management criteria in that they are statements of cause and effect; are possible answers to a fishery management problem; are a potential description of how the world works; connect the actual management actions with expected outcomes, and are focused and testable (Healey 2001). The scientific methods used to test the hypothesis are identified in this plan as the **monitoring and data assessment approach** and are comprised of established and routine procedures, surveys, analysis, and modeling. These scientific methods will comply with all Contemporary standard methods and reporting practices that are adopted by CALFED and Resource Agencies as they are developed, with provisions for updating methods based on Contemporary scientific norms that are likely to change during the term of the AMP. The AMP will not propose studies that would compromise the recovery of salmon and steelhead. An implementation schedule, or **timeline**, lists the duration and order of monitoring activities for each objective, and includes trigger events and end points. **Trigger events** are circumstances indicating that an adaptive response should be taken and **end points** are a goal and/or circumstance indicating that an objective has been attained and indicating that monitoring and data assessment is no longer needed under the AMP for that objective. Some objectives may not have end points and will require monitoring and data assessment for entire term of the AMP.

⁶⁶ The importance of marine-derived nutrients in salmon ecosystems and the possible ramifications to restoration efforts of cultural oligotrophication in streams like Battle Creek, where large numbers of salmon carcasses have been excluded for decades by the hydroelectric project, have been emerging in the awareness of fisheries researchers and managers in the past decade (e.g., see Gresh et al. in *Fisheries* 25(1), and Stockner et al. in *Fisheries* 25(5)).

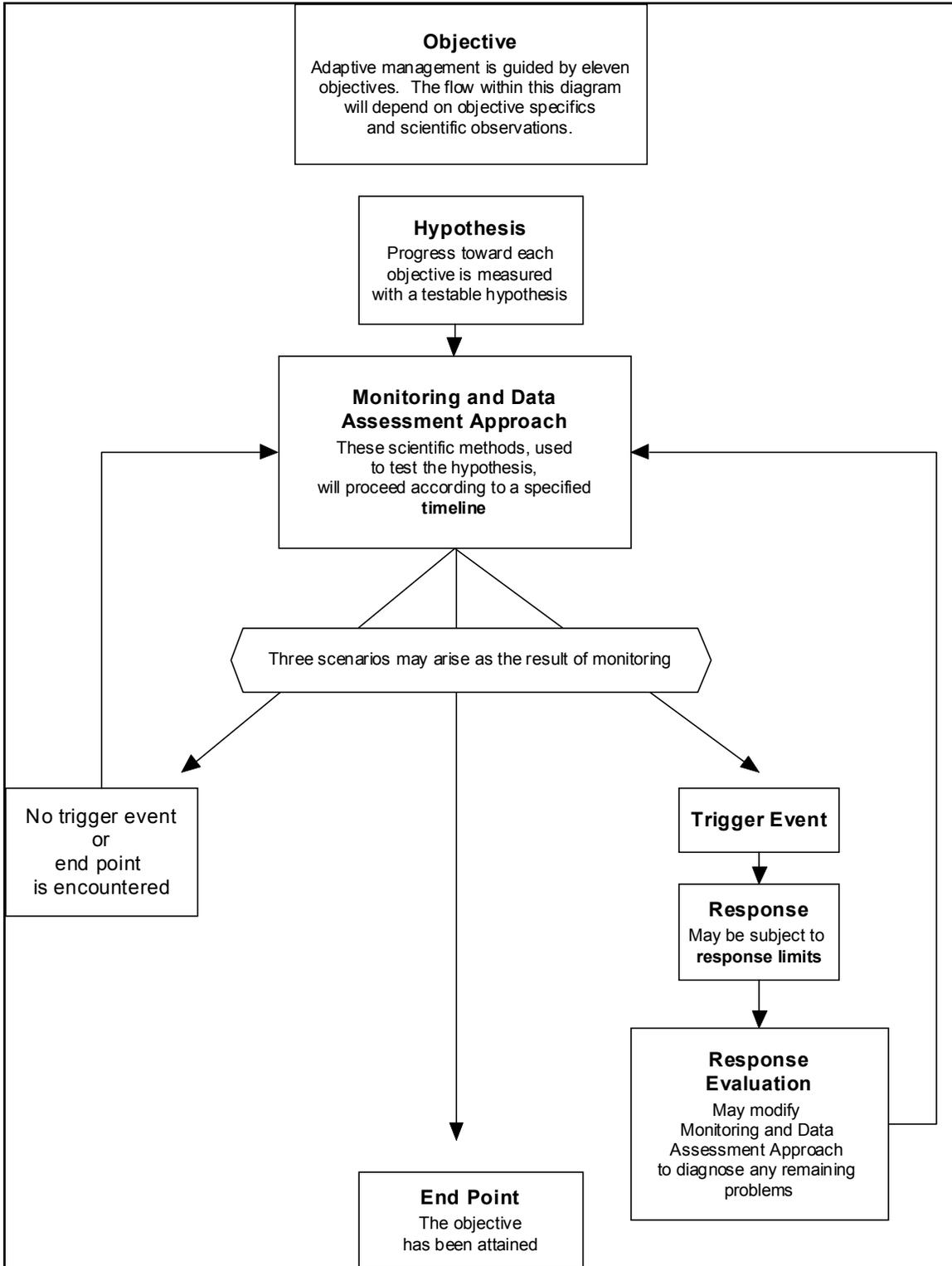


Figure 4. Flow chart depicting components of all adaptive management objectives and the general relationships between the various components.

Draft Adaptive Management Plan

If an objective is not being met and a trigger event occurs, then an adaptive **response** would be required, which could involve further diagnostic studies or modification of the hydroelectric project facilities or operations, or changes to natural features of the Restoration Project Area, designed to bring the system closer to achieving the objective. All responses must be feasible, practical, reasonable, prudent, and acceptable to the local community, though this does not preclude potentially major modifications to project facilities or operations. However, each response has **response limits** which describe the absolute scope of actions that can be taken in response to a trigger event.

Response limits are useful for long-term planning. However, response limits determined by complex processes, like the estimation of the future instream flow needs of salmon and steelhead, are impossible to predict because of unforeseeable changes in the policies or methodologies that will be used to determine them. Also, any changes in minimum flows need to be implemented through Consensus among the Parties and it is impossible to prejudge what that Consensus decision would be. Likewise, response limits may be confounded by conflicts between project goals and unforeseeable trigger events.

In general, response limits under the AMP will be determined by Consensus, guided by principles of feasibility, practicality, reasonability, prudence, local community acceptance, and will conform to limits identified by the FERC license amendment. Possible adaptive responses which fall outside of the FERC license amendment provisions, including major changes in project facilities such as new dams or dam removal, would require further decisions through established FERC processes. In addition, nothing in this AMP is intended to bind or prejudice the Resource Agencies, or otherwise limit their respective authorities, in the performance of their responsibilities under applicable federal and state laws.⁶⁷

All adaptive responses will be evaluated by **response evaluations** and outcomes of those adaptive responses will be compared to the objective. If the objective has been met, then the original monitoring and data assessment approach will be resumed. If the objective is still not met, the monitoring and data assessment approach may be modified to diagnose the problem.

An important component of the adaptive management process will be **reporting** which includes emergency reporting procedures, regular periodic reporting, and final long-term reporting as described in subsequent sections. An annual adaptive management report will summarize all data collected under these monitoring and data assessment approaches and will present analyses required within each objective. Certified raw data, and reports, generated under these objectives will be updated to appropriate agency and publicly accessible/locally endorsed and maintained information systems using database standards consistent with CMARP, Comprehensive Assessment and Monitoring Program (CAMP), and Environmental Protection Agency (EPA).

⁶⁷ MOU 5.7

Finally, the **responsibility/funding** for each adaptive management objective specifies who will fund studies, responses, and reporting.

III.B. Population Objectives

The first four adaptive management objectives specifically address fish populations in an effort to measure the progress toward the AMP goal of restoring chinook salmon and steelhead populations to the point they are viable and fully utilizing ecosystem carrying capacity. To do this, accurate assessments of the population size, trends in productivity, population substructure, and population diversity will be critical, though this plan focuses primarily on quantifying population size and trends in productivity. Recovery goals must ensure that natural populations are large enough to avert the risks associated with small population size. Accordingly, both the natural cohort replacement rate (CRR) (i.e., trends in productivity) and spawner abundance must be evaluated. This is because a high replacement rate with few parent spawners does not necessarily indicate recovery of the population. Conversely, an abundant spawning population may not indicate a recovered population if the CRR was negative (i.e., a declining population).⁶⁸ In order to quantify and gauge the progress toward these goals, the AMP has adopted NMFS definitions of “viable populations”⁶⁹ as the intermediate population target and full utilization of ecosystem carrying capacity as the eventual goal for each species of chinook salmon and steelhead.

III.B.1. Population Size

Small populations face a host of risks intrinsic to their low abundance; conversely, large populations exhibit a greater degree of resilience. A large part of the science of conservation biology involves understanding and predicting the effects of population size.⁶⁹ NMFS has published guidelines for viable population size (Table 5). A population must meet all of the viable population guidelines to be considered viable.⁶⁹

⁶⁸ The CRR is a parameter used to describe the number of future spawners produced by each existing spawner. This spawner-to-spawner ratio is defined as the number of naturally produced and naturally spawning adults in one generation divided by the number of naturally spawning adults (regardless of parentage) in the previous generation. As such, the ratio describes the rate at which each subsequent generation, or cohort, replaces the previous one and can be described as a natural cohort replacement rate (NMFS 1997).

⁶⁹ As defined in NMFS, Draft Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units, January 6, 2000 (NMFS 2000), “ **Viable salmonid population** is an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame. Other processes contributing to extinction risk (catastrophes and large-scale environmental variation) are also important considerations, but by their nature they need to be assessed at the larger temporal and spatial scales represented by evolutionarily significant units or other entire collections of populations.”

Draft Adaptive Management Plan

Table 5. NMFS viable population size guidelines.⁶⁹

<ol style="list-style-type: none">1. A population should be large enough to survive environmental variation of magnitudes observed in the past.2. A population must have sufficient abundance for any compensatory density dependent processes that affect the population to provide resilience to environmental and anthropogenic perturbation.3. A population should be sufficiently large to maintain its genetic diversity over the long term.4. A population should be sufficiently abundant to provide important ecological functions in all the environments it occupies.5. Population status evaluations should take uncertainty about abundance into account.
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The ability to accurately estimate adult and juvenile population sizes, and the validity of inferences drawn from those estimates, may be confounded by small population sizes and/or large variation in population size and distribution. Conclusions drawn from population estimations will take into account all statistical assumptions and limitations.

These NMFS guidelines for viable population size were considered when designing all four adaptive management population objectives and should be met through the implementation of these objectives.

III.B.2. Trends in Productivity

Trends in abundance reflect changes in factors that drive a population's dynamics and thus determine its abundance. Changes in environmental conditions, including ecological interactions, can influence a population's intrinsic productivity or the environment's ability to support a population (or both), and thus alter the underlying population dynamic over time. Such changes may result from random environmental variation over a wide range of temporal scales (environmental stochasticity). In this section, however, we are most concerned with trends in abundance that reflect systematic changes in a population's dynamics. Therefore changes in abundance caused by environmental stochasticity are treated as "noise" that, although important for estimating the population's extinction risk, acts to obscure persistent trends.⁶⁹ Again, NMFS has published trends and productivity guidelines (Table 6).

Table 6. NMFS trends and productivity guidelines.⁶⁹

1.	A population's natural productivity should be sufficient to maintain its abundance above the viable level.
2.	A Viable Salmonid Population that includes naturally spawning hatchery fish should exhibit sufficient productivity from naturally-produced spawners to maintain population abundance at or above viability thresholds in the absence of hatchery subsidy.
3.	A Viable Salmonid Population should exhibit sufficient productivity during freshwater life-history stages to maintain its abundance at or above viable thresholds—even during poor ocean conditions.
4.	A Viable Salmonid Population should not exhibit sustained declines in abundance that span multiple generations and affect multiple brood-year cycles.
5.	A Viable Salmonid Population should not exhibit trends in traits that portend productivity declines.
6.	Population status evaluations should take into account uncertainty about trends and productivity.

Trends in productivity will be monitored to assess the achievement of the AMP population objectives. To accomplish this, specific actions will be undertaken to monitor CRR. The CRR is a parameter used to describe the number of future spawners produced by each spawner. This spawner-to-spawner ratio is defined as the number of naturally produced and naturally spawning adults in one generation divided by the number of naturally spawning adults (regardless of parentage) in the previous generation. As such, the ratio describes the rate at which each subsequent generation, or cohort, replaces the previous one, and can be described as a natural CRR. When this rate is 1.0, the subsequent cohort exactly replaces the parental cohort and the population is in equilibrium, neither increasing or decreasing. When the rate is less than 1.0, subsequent cohorts fail to fully replace their parents and abundance declines. If the ratio is greater than 1.0, there is a net increase in the number of fish surviving to reproduce naturally in each generation and abundance increases.⁷⁰

For winter-run chinook, this parameter varies from year to year, but, in the Sacramento River, values of less than 1.0 were observed in the past, as expected in a decreasing population. In Battle Creek, environmental and habitat conditions will have to be improved enough to rebuild the population and to observe CRR values greater than 1.0. CRR must then remain at least near 1.0 for a period of time of high abundance to consider the species viable.⁷⁰

When estimating the value of CRRs, the true value will not be known. Hence, a certain number of samples will be needed to obtain an adequate precision. For example, to adequately estimate CRR for winter-run chinook in the Sacramento River, NMFS determined that nine samples are necessary, which requires 13 years of observation of spawner abundance because the maximum spawning age is 4 years (NMFS 1997). In Battle Creek, the sampling period is unknown because the population estimation precision is unknown. However, guidance on this issue will likely be forthcoming upon completion of NMFS' viable salmonid population definition process.

⁷⁰ NMFS Proposed recovery plan for the Sacramento River Winter-run chinook salmon. p IV-2.

Draft Adaptive Management Plan

These NMFS guidelines for trends and productivity were considered when designing all four adaptive management population objectives and should be met through the implementation of these objectives.

III.B.3. Population Substructure

When evaluating population viability, it is important to take within-population spatial structure needs into account for two main reasons: (1) because there is a time lag between changes in spatial structure and species-level effects, overall extinction risk at the 100-year time scale may be affected in ways not readily apparent from short-term observations of abundance and productivity; and (2) population structure affects evolutionary processes and may therefore alter a population's ability to respond to environmental change.⁷⁰ The first reason applies to the important conservation goal of restoring Battle Creek as a hedge against the extinction of winter-run chinook, and the second reason is important because many habitats in which Battle Creek fish live will not be specifically managed by AMP objectives (e.g., land use in the upper watershed, Sacramento-San Joaquin Delta). The attention given in the AMP to sub-watershed production estimates (i.e., within the two forks of Battle Creek), as well as the false attraction and reach-by-reach habitat protection measures, were designed to meet the NMFS guidelines for spatial structure (Table 7).

Table 7. NMFS spatial structure guidelines.⁶⁹

<ol style="list-style-type: none">1. Habitat patches should not be destroyed faster than they are naturally created.2. Natural rates of straying among subpopulations should not be substantially increased or decreased by human actions.3. Maintain some habitat patches that appear to be suitable or marginally suitable, but currently contain no fish.4. Source subpopulations should be maintained.5. Analyses of population spatial processes should take uncertainty into account.

III.B.4. Population Diversity

Several salmonid traits exhibit considerable diversity within and among populations, and this variation has important effects on population viability (Appendix A.7). Some of these varying traits are anadromy, morphology, fecundity, run timing, spawn timing, juvenile behavior, age at smolting, age at maturity, egg size, developmental rate, ocean distribution patterns, male and female spawning behavior, physiology and molecular genetic characteristics. Of these traits, some (such as DNA or protein sequence variation) are completely genetically based, whereas others (such as nearly all morphological, behavioral, and life-history traits) usually vary as a result of a combination of genetic and environmental factors.

In a spatially and temporally varying environment, there are three general reasons why diversity is important for species and population viability. First, diversity allows a species to use a wider array of environments than they could without it. For example,

varying adult run and spawn timing allows several salmonid species to use a greater variety of spawning habitats than would be possible without this diversity. Second, diversity protects a species against short-term spatial and temporal changes in the environment. Fish with different characteristics have different likelihoods of persisting, depending on local environmental conditions. Therefore, the more diverse a population is, the more likely it is that some individuals would survive and reproduce in the face of environmental variation. Third, genetic diversity provides the raw material for surviving long-term environmental changes. Salmonids regularly face cyclic or directional changes in their freshwater, estuarine, and ocean environments due to natural and human causes, and genetic diversity allows them to adapt to these changes.⁷¹

The AMP passage objectives take great steps towards restoring the natural process of dispersal throughout the Battle Creek watershed while AMP habitat objectives are intended to aid in the restoration the ecosystem function, essentially those natural processes that cause ecological variation (Table 8). Other human-caused factors have been previously identified in the Battle Creek watershed (e.g., see Ward and Kier 1999b for a summary of concerns) that affect population diversity, including traits such as run timing, age structure, size, fecundity, behavior, and molecular genetic characteristics, include the operation of the CNFH barrier dam, hatchery selection of spawning fish, use of Sacramento River winter-run chinook in Battle Creek, and superimposition by hatchery fish on wild fish redds. Factors from outside of the Battle Creek watershed also affect these population diversity traits including operations of water diversions (e.g., Red Bluff Diversion Dams, delta pumps), commercial and sport fisheries, and temperature control in the Sacramento River (NOAA 1994; CDFG 1998). These activities which may threaten population diversity will be addressed through the AMP linkages.

Table 8. NMFS diversity guidelines.⁶⁹

<ol style="list-style-type: none">1. Human-caused factors such as habitat changes, harvest pressures, artificial propagation, and exotic species introduction should not substantially alter traits such as run timing, age structure, size, fecundity, morphology, behavior, and molecular genetic characteristics.2. Natural processes of dispersal should be maintained. Human-caused factors should not substantially alter the rate of gene flow among populations.3. Natural processes that cause ecological variation should be maintained.4. Population status evaluations should take uncertainty about requisite levels of diversity into account.

III.B.5. Carrying Capacity

Carrying capacity represents a population size that the resources of the environment can maintain without large fluctuations. As populations fully utilize their environment, competition between the same species for resources (intraspecific competition) acts to equalize the birth and death rates, thus stabilizing the population. Carrying capacity changes. For instance, the carrying capacity of Battle Creek for

⁷¹ NMFS Proposed recovery plan for the Sacramento River Winter-run chinook salmon. p IV-20-21.

Draft Adaptive Management Plan

anadromous salmonids in the post-restoration state is expected to be much higher than the current depressed carrying capacity.

The natural environment must be able to support large enough populations to reduce radical fluctuations associated with small populations (demographic stochasticity) and environmental variation. Current salmon and steelhead populations, particularly winter- and spring-run chinook, are small enough to be susceptible to extinction as a result of random events tied to reproduction. Therefore, the objectives of this AMP are to increase habitat volume and quality, and fish access to habitat, so that salmon and steelhead populations increase to a size where risks from random variation associated with demographics and the environment are minimized. With the implementation of the Restoration Project, the CRR average is expected to rise above 1.0 for consecutive generations to rebuild salmon and steelhead populations. As populations begin to reach carrying capacity, the CRR trend will begin to decline and stabilize near 1.0. If the three-year running CRR average falls below 1.0 and the viable populations standard has not been met, then the limiting factors will be identified and addressed by the AMP.

Carrying capacity is reached when the CRR has stabilized for several generations at 1.0 after many generations of a CRR greater than 1.0. It is possible that the carrying capacity could be reached but the populations remain below the “viable population” levels or estimated maximum natural production levels, or the viable population standard could be met, but be below the carrying capacity. Thus, in evaluating carrying capacity and viable populations, it is important to consider condition of the habitat, absolute population size, and the CRR. Furthermore, naturally caused fluctuations in populations, and the long period of time that CRR must average 1.0, confound the ability to determine when populations are at carrying capacity.

No formal estimates of carrying capacity have been generated for Battle Creek, either in its pre-restoration or post-restoration states. The Restoration Project is expected to increase the carrying capacity of the watershed, though the methods to precisely determine carrying capacity are limited at this time. The AMTT will work to identify when salmon and steelhead are fully utilizing the restored habitat of Battle Creek. The AMTT may use USFWS (1995; Table 9) as guidance. USFWS (1995) predicted population sizes of chinook salmon and steelhead in Battle Creek after implementing restoration measures that were less comprehensive than those proposed under the Restoration Project.

Table 9. Predicted population sizes of chinook salmon and steelhead in Battle Creek after implementing restoration measures outlined in USFWS (1995).

Battle Creek Anadromous Fish Populations	Numbers of Adult Fish
Winter-run chinook salmon	2,500
Spring-run chinook salmon	2,500
Fall-run chinook salmon	4,500
Late-fall-run chinook salmon	4,500
Steelhead	5,700
Total	19,700

POPULATION OBJECTIVE 1

Ensure successful salmon and steelhead spawning and juvenile production.

HYPOTHESIS: Implementation of instream flow levels and facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure that juvenile salmon and steelhead production is within the expected level given the number of spawning adults and relevant ecological factors.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Establish pre-project estimates of juvenile production using outmigrant traps at the terminus of the Restoration Project Area upstream of CNFH⁷²; (2) Estimate adult and jack population sizes and distribution using adult counts at fish ladders, carcass counts, snorkel surveys, and/or redd surveys; (3) Estimate juvenile production using an out-migrant trap at the terminus of the Restoration Project Area upstream of CNFH; (4) Estimate juvenile production using outmigrant traps at the terminus of each fork during years and seasons as needed, when adult population levels are sufficient to produce statistically detectable numbers of juvenile outmigrants⁷³; (5) Evaluate physical and biological conditions within habitats by reach; (6) Compare juvenile production, by fork and mainstem reach, with production expected from previous spawning populations, in those areas, in light of relevant ecological factors; (7) Compare juvenile production, by fork and mainstem reach, with production observed in Reference Watersheds.

TIMELINE: (1) Each monitoring and data assessment approach applies separately for each run of salmon and steelhead to reflect the diversity of life histories⁷⁴; (2) Sample juvenile production when adult population levels are sufficient to produce statistically detectable numbers of juvenile outmigrants; (3) Sample, when feasible, juvenile production during all periods of juvenile movement; (4) Sample juvenile production especially during drought.

TRIGGER EVENT: Juvenile production not within expected range given the number of spawning adult salmon and steelhead and relevant ecological factors. For example, if a year-class failure occurs in Battle Creek but not in Reference Watersheds.

RESPONSE: (1) If the limiting factor is flow-related, then the response would be that set forth in Habitat Objective 1; (2) If the limiting factor is water temperature-related, then the response would be that set forth in Habitat Objective 2; (3) If the limiting factor is unidentifiable after testing hypotheses from all habitat and passage objectives, then identify unanticipated limiting factors and work to eliminate those factors that are controllable and related to the Restoration Project.⁷⁵

RESPONSE LIMITS: (1) If the limiting factor is identified by testing hypotheses from any of the habitat and passage objectives, then the response limits would be based on the appropriate objective; (2) If the limiting factor is not associated with any of the objectives, but is controllable and related to the Restoration Project, then the response limit will be any action deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, provided that Consensus has been reached among the Parties.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: (1) There is no end point for juvenile production monitoring at the terminus of the Restoration Project Area upstream of the CNFH; (2) There is no end point for estimating adult and jack population sizes; (3) Trapping on the forks will continue until the AMTT decides it is no longer necessary (i.e., the hypothesis is met during a reasonable number of years of extreme water conditions); (4) Comparisons of actual versus expected juvenile production, and comparisons with Reference Watersheds are terminated when Population Objective 4 has been reached and juvenile production is within the expected range.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: (1) Licensee will conduct and/or fund, up to the Licensee's Commitment, adult counts at fish ladders in the initial three-year period of operation. Pursuant to adaptive management protocols, if salmon and steelhead populations are insufficient to affirm ladder effectiveness under continuous duty, then Licensee will conduct and/or fund adult counts at fish ladders for a longer period of time to be determined by mutual agreement per protocols. (2) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding for other monitoring and data assessments.

⁷² Establishing pre-project estimates of production are important to prove the results of the Restoration Project, as a foundation for adaptive management, and to comply with CAMP protocols. Pre-project production estimates would be made under the present interim flow agreement and present screw-trapping and snorkeling surveys. Some limited data collected during the period of FERC-required flows exist.

⁷³ Monitoring in both forks is important because of different habitats, limiting factors, and management actions/facilities within each fork.

⁷⁴ See Ward and Kier (1999a) for life history information.

⁷⁵ The response to factors that are controllable but not related to the Restoration Project will depend on the appropriate agency initiatives identified in the "Linkages" section of this report. Identification of uncontrollable factors could lead to a reassessment of "relevant ecological factors."

POPULATION OBJECTIVE 2

Restore and recover the assemblage of anadromous salmonids (i.e., winter-run, spring-run, steelhead) that inhabit the stream's cooler reaches during the dry season

HYPOTHESIS: Implementation of instream flow levels and facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure that populations of spring-run, winter-run and steelhead are at Viable Population Levels.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Estimate adult and jack population sizes using adult counts at fish ladders, carcass counts, snorkel surveys, and/or redd surveys; (2) Estimate juvenile production using out-migrant traps within the Restoration Project Area; (3) Calculate, analyze, and monitor CRR according to protocols; (4) After population levels are sufficient to reliably calculate CRR, compare 3-year running average CRR with expected CRR; (5) Compare trends in CRR with limiting factors from outside the Restoration Project area using the linked monitoring in the Sacramento River system; (6) Compare trends in CRR with Reference Watersheds.

TIMELINE: (1) Each monitoring and data assessment approach applies separately for each run of salmon and steelhead to reflect the diversity of life histories; (2) Estimates of adult population size and juvenile production will be made throughout the term of the AMP or until this Objective is met; (3) CRR protocols suggest that calculation and analysis of CRR will continue for a minimum of 13 years plus three years and will likely extend for at least the term of the AMP.

TRIGGER EVENT: The three-year running average CRR falls below 1.0 after CRR can be reliably calculated according to CRR protocols above, and trends in CRR differ from CRR trends in Reference Watersheds.

RESPONSE: (1) If the limiting factor is flow-related, then the response would be that set forth in Habitat Objective 1; (2) If the limiting factor is water temperature-related, then the response would be that set forth in Habitat Objective 2; (3) If the limiting factor is unidentifiable after testing hypotheses from all habitat and passage objectives, then identify unanticipated limiting factors and work to eliminate those factors that are controllable and related to the Restoration Project.⁷⁶

RESPONSE LIMITS: (1) If the limiting factor is identified by testing hypotheses from any of the habitat and passage objectives, then the response limits would be based on the appropriate objective; (2) If the limiting factor is not associated with any of the objectives, but is controllable and related to the Restoration Project, then the response limit will be any action deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, provided that Consensus has been reached among the Parties.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: Continue these monitoring and data assessment approaches, separately for each run of salmon and steelhead, until populations reach Viable Population Levels.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: (1) Licensee will conduct and/or fund, up to the Licensee's Commitment, adult counts at fish ladders in the initial three-year period of operation. Pursuant to adaptive management protocols, if salmon and steelhead populations are insufficient to affirm ladder effectiveness under continuous duty, then Licensee will conduct and/or fund adult counts at fish ladders for a longer period of time to be determined by mutual agreement per protocols. (2) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding for other monitoring and data assessments. (3) NMFS will define recovery goals for anadromous salmonid species in Battle Creek listed under the ESA at any time during the term of the AMP.

⁷⁶ The response to factors that are controllable but not related to the Restoration Project will depend on the appropriate agency initiatives identified in the "Linkages" section of this report. Identification of uncontrollable factors could lead to a reassessment of "relevant ecological factors."

POPULATION OBJECTIVE 3

Restore and recover the assemblage of anadromous salmonids (i.e., fall-run, late-fall-run) that enter the stream as adults in the wet season and spawn upon arrival.

HYPOTHESIS: Implementation of instream flow levels and facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure that populations of fall-run and late-fall-run are at Viable Population Levels.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Estimate adult and jack population sizes and distribution using adult counts at fish ladders, carcass counts, snorkel surveys, and/or redd surveys; (2) Estimate juvenile production using out-migrant traps within the Restoration Project Area; (3) Calculate, analyze, and monitor CRR according to protocols; (4) After population levels are sufficient to reliably calculate CRR, compare 3-year running average CRR with expected CRR; (5) Compare trends in CRR with limiting factors from outside the Restoration Project area using the linked monitoring in the Sacramento River system; (6) Compare trends in CRR with Reference Watersheds.

TIMELINE: (1) Each monitoring and data assessment approach applies separately for each run of salmon to reflect the diversity of life histories; (2) Estimation of adult population size and juvenile production will be made throughout the term of the AMP or until this Objective is met; (3) CRR protocols suggest that calculation and analysis of CRR will continue for a minimum of 13 years plus three years and will likely extend for at least the term of the AMP.

TRIGGER EVENT: The three-year running average CRR falls below 1.0 after CRR can be reliably calculated according to CRR protocols above and trends in CRR differ from CRR trends in Reference Watersheds.

RESPONSE: (1) If the limiting factor is flow-related, then the response would be that set forth in Habitat Objective 1; (2) If the limiting factor is water temperature-related, then the response would be that set forth in Habitat Objective 2; (3) If the limiting factor is unidentifiable after testing hypotheses from all habitat and passage objectives, then identify unanticipated limiting factors and work to eliminate those factors that are controllable and related to the Restoration Project.⁷⁷

RESPONSE LIMITS: (1) If the limiting factor is identified by testing hypotheses from any of the habitat and passage objectives, then the response limits would be based on the appropriate objective; (2) If the limiting factor is not associated with any of the objectives, but is controllable and related to the Restoration Project, then the response limit will be any action deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, provided that Consensus has been reached among the Parties.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: Continue these monitoring and data assessment approaches, separately for each run of salmon and steelhead, until populations reach Viable Population Levels.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: (1) Licensee will conduct and/or fund, up to the Licensee's Commitment, adult counts at fish ladders in the initial three-year period of operation. Pursuant to adaptive management protocols, if salmon and steelhead populations are insufficient to affirm ladder effectiveness under continuous duty, then Licensee will conduct and/or fund adult counts at fish ladders for a longer period of time to be determined by mutual agreement per protocols. (2) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding for other monitoring and data assessments. (3) NMFS will define recovery goals for anadromous salmonid species in Battle Creek listed under the ESA including species that may not be listed at the time the AMP was originally drafted.

⁷⁷ The response to factors that are controllable but not related to the Restoration Project will depend on the appropriate agency initiatives identified in the "Linkages" section of this report. Identification of uncontrollable factors could lead to a reassessment of "relevant ecological factors."

POPULATION OBJECTIVE 4

Ensure salmon and steelhead fully utilize available habitat in a manner that benefits all life stages, thereby maximizing natural production and full utilization of ecosystem carrying capacity.

HYPOTHESIS: Implementation of instream flow levels and facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure that, once populations of anadromous salmonids are at Viable Population Levels, the natural production of populations of anadromous salmonids within the Restoration Project Area is maximized based on full utilization of habitat and ecosystem carrying capacity.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Perform monitoring for this objective once each population of anadromous salmonid reaches Viable Population Levels; (2) Estimate adult and jack population sizes using adult counts at fish ladders, carcass counts, snorkel surveys, and/or redd surveys; (3) Estimate juvenile production using out-migrant traps and other Contemporary sampling techniques within the Restoration Project Area; (4) Define the carrying capacity of each species and life stage of salmon and steelhead and compare populations with expectations of carrying capacity; (5) Determine if natural production in the Restoration Project Area is maximized; (6) Calculate, analyze, and monitor CRR according to protocols; (7) Compare 3-year running average CRR with expected CRR; (8) Compare long-term CRR trend for a decade and compare with a consistent value of 1.0.

TIMELINE: (1) Each monitoring and data assessment approach applies separately for each species of salmon or steelhead to reflect the diversity of life histories; (2) Estimation of adult population size and juvenile production will be made throughout the term of the AMP or until this Objective is met; (3) CRR protocols suggest that calculation and analysis of CRR will continue for a minimum of 13 years plus 3 years and will likely extend for at least the term of the AMP.

TRIGGER EVENT: (1) The three-year running average CRR falls below 1.0 after Viable Populations Levels have been reached, and long-term trends in CRR differ from CRR trends in Reference Watersheds; (2) CRR reach a consistent value of 1.0 for several generations but the populations size(s) are less than the expected carrying capacity; (3) Natural production of any species or life history stage in the Restoration Project Area is less than expected levels of production.

RESPONSE: If CRR falls below 1.0 and long-term trends differ from Reference Watersheds, or if CRR stabilizes at 1.0 but the populations sizes are lower than expected, or if natural production of any species or life history stage is less than expected, then identify unanticipated limiting factors, and either work to eliminate those factors that are controllable, related to the Restoration Project, and within response limits, or refine estimates of expected carrying capacity.

RESPONSE LIMITS: (1) If the limiting factor is identified by testing hypotheses from any of the habitat and passage objectives, then the response limits would be based on the appropriate objective; (2) If the limiting factor is not associated with any of the objectives, but is controllable and related to the Restoration Project, then the response limit will be any action deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, provided that Consensus has been reached among the Parties.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: Continue these monitoring and data assessment approaches, separately for each run of salmon and steelhead, until natural production within the Restoration Project Area is maximized and ecosystem carrying capacity is fully utilized.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: (1) Licensee will conduct and/or fund, up to the Licensee's Commitment, adult counts at fish ladders in the initial three-year period of operation. Pursuant to adaptive management protocols, if salmon and steelhead populations are insufficient to affirm ladder effectiveness under continuous duty, then Licensee will conduct and/or fund adult counts at fish ladders for a longer period of time to be determined by mutual agreement per protocols. (2) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding for other monitoring and data assessments.

III.C. Habitat Objectives

Four adaptive management objectives specifically address fish habitat in an effort to measure the progress toward the AMP goal of restoring chinook salmon and steelhead populations to the point they are viable and fully utilizing ecosystem carrying capacity. All four of these objectives are designed, in part, to adaptively manage the flows prescribed by the MOU. These flows were determined through careful analysis and Consensus, and are considered the best scientific estimate of biologically optimum flows. Hence, these flows are at an excellent level for salmon and steelhead restoration, are likely better for restoration than flows set through a strictly regulatory process, are considered to be insurance against future uncertainty, and are not intended to be adjusted experimentally.

As noted in the discussion of response limits above, response limits for the instream flows needs of salmon and steelhead are impossible to predict because of unforeseeable changes in the policies or methodologies that will be used to determine them, because of potential conflicts between project goals and unforeseeable trigger events, and because it is impossible to prejudge Consensus in future decision making. Therefore, any adaptive management instream flow levels response will be made provided that Consensus is reached among the Parties, to the extent funding is available from the WAF, AMF, Licensee commitment, and other Adaptive Management funds. If Consensus is not met, minimum instream flow changes will be determined via the dispute resolution process (see Section V.F.).

Field observations were conducted per MOU Attachment 2 to determine the feasibility for establishing a threshold criteria of flow and stage above which Ramping Rates will not be required in Battle Creek. Field observations by fisheries biologists from CDFG and PG&E and by a USBR contractor were conducted in the spring of 2000 (CDFG 2001). Initially, areas of potential stranding habitat were identified by aerial surveys of the North and South Forks of Battle Creek in the Restoration Project Area. Several sites with significant potential for fish stranding due to flow fluctuations (e.g., large, low-gradient, in-channel gravel bars or bedrock areas, or side-channels, that could be de-watered during flow changes) were identified on the South Fork, while such sites were relatively rare on the North Fork.

A test flow change was analyzed at one South Fork site with relatively high stranding potential. Based on field observations, it was determined that ramping-related fish stranding would be avoided at flows greater than 460 cfs. These flows fill the South Fork channel sufficiently to inundate all potential stranding habitat. Rapid instream flow reductions at flows less than 460 cfs may dewater potential stranding habitat. Therefore, Ramping Rate criteria developed in this AMP would apply in the South Fork at flows less than 460 cfs, but would not apply at flows greater than this threshold.

At the time of this AMP's publication, field observations of the relationship between flow changes and potential stranding habitat in the North Fork had not been completed. However, the general channel morphology of the North Fork, consisting of

Draft Adaptive Management Plan

steep-sided canyon walls, indicates that a threshold flow for initiating a Ramping Rate would be much less than that of the South Fork, which flows in a less incised canyon.

HABITAT OBJECTIVE 1

Maximize usable habitat quantity – volume.

HYPOTHESIS: Implementation of instream flow levels specified in the description of the Restoration Project and implementation of any adaptive responses affecting instream flows will provide at least 95 percent of maximum usable habitat quantity for critical life stages among priority species.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Compare observations with expected habitat use once there is enough salmon and steelhead to use available areas; (2) Observe and record anadromous salmonid habitat use during the course of other monitoring studies; (3) Apply any appropriate advancements or refinements that significantly reduce uncertainty in flow/habitat relationships; (4) examine flow monitoring measurements taken immediately below each dam for the Facilities Monitoring Plan.

TIMELINE: (1) Apply appropriate, significant advancements in instream flow analysis as they become available; (2) Apply appropriate habitat use data as it is accumulated.

TRIGGER EVENT: (1) Significant advancements or refinements arise that reduce uncertainty in flow/habitat relationships and indicate that changes to instream flows are needed; (2) Observed habitat use is not consistent with expected habitat use at a time when there are enough salmon and steelhead to get a reliable data set.

RESPONSE: (1) Incorporate significant advancements or refinements into existing or new instream flow models, (2) If observations of habitat use are not consistent with expected habitat use, then conduct a verification study of anadromous salmonid habitat use according to Contemporary protocols; (3) If suggested by the verification study, then develop new habitat suitability criteria; (4) Recommend changing instream flows as appropriate consistent with MOU and FERC protocols.

RESPONSE LIMITS: All minimum instream flow changes deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, will be implemented, provided that Consensus has been reached among the Parties and dedicated funding is available. If Consensus has not been reached, then minimum flow changes will be determined through the dispute resolution process.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: None.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: Resource Agencies will, subject to available funds, conduct and/or fund or seek funding for data collection and report preparation. Other programs (e.g., CVPIA and CALFED) would be solicited to fund additional diagnostic assessment tools to design a proper response (e.g., instream flow modeling). Water acquisition would be funded by the WAF, and AMF upon exhaustion of WAF. If both funds are exhausted and Consensus is reached, the Licensee funds water acquisition up to the Licensee's commitment. If both funds are exhausted and Consensus is not reached, funding of minimum instream flows will be determined through the dispute resolution process, up to the Licensee's commitment.

HABITAT OBJECTIVE 2

Maximize usable habitat quantity – water temperature.

HYPOTHESIS: Implementation of instream flow levels and facilities modifications specified in the description of the Restoration Project and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will provide instream water temperatures that are suitable for critical life stages among species at appropriate stream reaches.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Monitor climatic conditions within the South Fork watershed by establishing an appropriate weather station to support water temperature modeling efforts; (2) Monitor longitudinal water temperature regime of stream to determine attainability of water temperature goals⁷⁸ for each stream reach; (3) CDFG will monitor any springs to which it has conservation water rights; (4) Compare longitudinal water temperature regime with target points within the stream; (5) Compare monitoring results with predictions from the best available Contemporary water temperature models applied to appropriate stream reaches.

TIMELINE: (1) Monitor climatic and longitudinal water temperature regime for at least five years for system-wide water temperature monitoring including at least at least one year of dry/hot conditions; (2) Maintain key water temperature monitoring stations at appropriate locations for the term of the AMP.

TRIGGER EVENT: Water temperature goals are not attained in specific reaches under climatic conditions when attainment is expected.

RESPONSE: (1) Apply the best available Contemporary water temperature model to determine if water temperature goals could be met and/or exceeded under different climatic conditions by changing instream flows or spring releases from hydroelectric project water collection facilities; (2) If so indicated by the model, develop a rule-based plan⁷⁹ for short-term changes in the flows to reduce water temperatures to target ranges during hot weather,⁸⁰ and perform a verification test of project operations according to the rule-based plan to determine if water temperature goals could be achieved; (3) Acquire water and/or spring releases from hydroelectric project water collection facilities to increase instream flows as needed.

RESPONSE LIMITS: All instream flow changes for water temperature adjustment deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, will be implemented, provided that Consensus has been reached among the Parties and dedicated funding is available. If Consensus has not been reached, then instream flow changes for water temperature adjustment will be determined through the dispute resolution process.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: (1) Monitoring the longitudinal water temperature regime would end after the AMTT determines the attainability of water temperature goals for each stream reach; (2) Prescriptive actions under the rule-based plan for selected water temperature target points would remain in effect for the term of the AMP; (3) There is no end point for key water temperature monitoring stations.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3. The annual adaptive management report will summarize all data collected under these monitoring and data assessment approaches and will present analyses required herein during the development of the rule-based plan and during implementation of the rule-based plan. Periodic updates of summarized raw data will be made to match the frequency of meetings of the AMTT.

RESPONSIBILITY/FUNDING: Resource Agencies will, subject to available funds, conduct and/or fund or seek funding sources other than Licensee for water temperature and climatic data collection. Other programs (e.g., CVPIA and CALFED) would be solicited to fund additional diagnostic assessment tools to design a proper response (e.g., water temperature modeling). Water acquisition would be funded by the WAF, and AMF upon exhaustion of WAF. If both funds are exhausted and Consensus is reached, the Licensee funds water acquisition up to the Licensee's commitment. If both funds are exhausted and Consensus is not reached, funding of water acquisition will be determined through the dispute resolution process, up to the Licensee's commitment.

⁷⁸ Specific temperature goals for each reach based on temperature criteria and geographic prioritization are described in the *Battle Creek Salmon and Steelhead Restoration Plan*. The post-Restoration Project operations will be monitored to examine attainability under different controllable factors.

⁷⁹ The rule-based plan would provide hydroelectric project operators with a predictive model that would allow them to adjust flow for the next day based on the current day's observed water temperatures and other variables. This rule-based plan will consider geographical limits and/or the attainability of temperature criteria, it will contain an allowance for deviations from criteria, and it will contain enough flexibility to cope with contingencies. This rule-based plan would be developed based on established temperature protocols such as the NMFS draft temperature guidelines.

HABITAT OBJECTIVE 3

Minimize false attraction and harmful fluctuation in thermal and flow regimes due to planned outages or detectable leaks from the hydroelectric project.⁸¹

HYPOTHESIS: Implementation of facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure that water discharges from the powerhouse tailrace connectors or water conveyance system are confined to times and amounts that avoid false attraction or biologically significant changes to thermal and chemical regimes.⁸²

MONITORING AND DATA ASSESSMENT APPROACH: (1) During the course of other monitoring studies, determine if salmon or steelhead appear to be responding to leakage from powerhouse tailrace connectors or discharges from the water conveyance system; (2) If salmon or steelhead appear to be responding to leakage from powerhouse tailrace connectors or discharges from the water conveyance system, (a) measure leakage or discharges, (b) compare volume of leakage or discharge to streamflow at all times it is known to occur, (c) determine if the discharge measurably alters the thermal or chemical regimes of the South Fork of Battle Creek.⁸²

TIMELINE: Continue monitoring and data assessment approaches for the term of the AMP.

TRIGGER EVENT: (1) Direct evidence of an adverse fish response to leakages or discharges from the hydroelectric project is observed; (2) Facilities monitoring identifies and estimates significant intentional or unintentional release from the powerhouse tailrace connectors or discharge from the water conveyance system to the South Fork.

RESPONSE: Restore isolation of water in the powerhouse tailrace connectors and/or water conveyance system from the South Fork of Battle Creek.

RESPONSE LIMITS: Restore isolation to the extent that it is practical and feasible by Contemporary engineering practices for water conveyance structures provided that actions do not threaten the safety of the water conveyance system and dedicated funding is available.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: None

REPORTING: Per the Facilities Monitoring Plan. Per standard data management procedures described in Section V.B.

RESPONSIBILITY/FUNDING: Installation costs of new/additional facilities required to meet Contemporary criteria or modification of existing facilities to avoid fish injury or mortality would be paid by AMF protocols. However, in the event that the AMF is exhausted, the Licensee will pay up to the Licensee's Commitment for Authorized Modifications to project facilities which are determined to be necessary under adaptive management. (1) Licensee conducts and/or funds the facilities monitoring consistent with the Facilities Monitoring Plan, including recording the timing and estimated amounts of water released from the canal gates and spill channels during known releases from the conveyance system; (2) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding sources other than the Licensee for relevant biological monitoring and measurement of any unintentional leakage or discharge that elicits a response from salmon or steelhead.

⁸⁰ There may be a need to balance temperature control with other habitat effects of flow changes, but based on action priorities developed herein, temperature control may take priority over other habitat effects.

⁸¹ Planned outages from the powerhouse tailrace connectors or water conveyance system to the South Fork will occur during the period from February 1 through April 30, as specified in the MOU, and will be monitored per the Facilities Monitoring Plan. Forced outages are not covered under this AMP because they are assumed to occur infrequently and under emergency situations, and produce discharges of relatively short duration. In the event that these assumptions are not met, this objective could be modified to include forced outages. Emergencies are addressed in the AMP protocol section.

⁸² "Chemical" in this sense refers to chemical constituents of stream water at detectable levels that may be used by migrating salmonids for homing or spawning area recognition.

HABITAT OBJECTIVE 4

Minimize stranding or isolation of salmon and steelhead due to variations in flow regimes caused by hydroelectric project operations.

HYPOTHESIS: Implementation of facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure that following forced or scheduled outages where the available diversion flow has been released to the natural stream channel, variations in flow regimes do not strand salmon and steelhead or isolate them from their habitat when diversions are resumed.

MONITORING AND DATA ASSESSMENT APPROACH: (1) In the course of other monitoring studies, evaluate, in the South Fork, threshold flow levels above which ramping-rates may differ from 0.1 feet/hour⁸³; (2) In the North Fork, conduct a diagnostic study of ramping thresholds to determine the flow level above which ramping rates may differ from 0.1 foot/hour; (3) Collect evidence of fish stranding during the course of other monitoring studies; (4) Monitor Ramping Rates and threshold flow levels during scheduled outages at appropriate sites to ascertain their effectiveness to avoid stranding and/or isolating anadromous fish from their preferred habitat⁸⁴; (5) Monitor natural flow fluctuations not caused by project operations to ascertain their effect on stranding and/or isolating anadromous salmonids; (6) Compare the stranding effects of project-induced ramping and natural flow fluctuations.

TIMELINE: (1) The diagnostic study of threshold flows in the North Fork will be completed the first time flow conditions are appropriate and may occur as early as spring 2001; (2) Evidence of fish stranding will be collected through the term of the AMP, (3) Monitoring of Ramping Rates will be conducted during scheduled outages; (4) Monitoring of natural flow fluctuations will be conducted the first time flow conditions are appropriate and may occur as early as spring 2001; (5) Comparisons of project-induced ramping and natural flow fluctuations will be completed as soon as flow conditions permit.

TRIGGER EVENT: Biologically significant salmon and steelhead stranding or isolation, caused by project-induced ramping and natural flow fluctuations, is observed.

RESPONSE: Conduct a diagnostic assessment of ramping effects on anadromous salmonids at the 0.1 foot/hour rate specified in the MOU, or slower, that determines the relationship between stranding/isolation and Ramping Rates using statistically valid techniques. The assessment would recommend a more appropriate Ramping Rate.

RESPONSE LIMITS: All instream flow changes for ramping deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, will be implemented, provided that Consensus has been reached among the Parties. If Consensus has not been reached, then instream flow changes for ramping will be determined through the dispute resolution process.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: Ramping Rate is finalized base on diagnostic assessment Ramping Rate study or response evaluation.

REPORTING: Results from the Ramping Rate study will be incorporated into the annual Adaptive Management report. Other reporting and data management per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: (1) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding for incidental monitoring and the diagnostic Ramping Rate assessment; (2) Licensee will fund, up to the Licensee's Commitment, costs associated with more restrictive Ramping Rates, consistent with WAF and AMF protocols.⁸⁵

⁸³ CDFG (2001) determined that 460 cfs is an adequate threshold flow below which ramping rates should be applied for the protection of salmon and steelhead downstream of Inskip Dam (and above which ramping rates need not be applied) following the implementation of the Restoration Project.

⁸⁴ MOU Section 9.1A.2.(c)

⁸⁵ MOU Section 6.1.D and MOU Attachment 2

III.D. Passage Objectives

Three Adaptive Management objectives specifically address fish passage in an effort to measure the progress toward the AMP goal of restoring chinook salmon and steelhead populations to the point they are viable and fully utilizing ecosystem carrying capacity. All three of these objectives are designed to adaptively manage the fish passage provisions in the MOU and facilities constructed as part of the Restoration Project. These facilities represent state-of-the-art designs based on considerable fish passage engineering and biological experience. Hence, these fish passage facilities and provisions are an excellent start for salmon and steelhead restoration, are considered to be insurance against future uncertainty, and are not intended to be adjusted experimentally.

PASSAGE OBJECTIVE 1

Provide reliable upstream passage of salmon and steelhead adults at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams per Contemporary engineering standards/guidelines.

HYPOTHESIS: Implementation of facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure unimpeded passage of adult salmon and steelhead at fish ladders relative to Contemporary standards/guidelines.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Use video or electronic counters in ladders to count anadromous salmonids; (2) Compare ladder counts with spawner distribution and predicted habitat use; (3) In the course of other studies, look for direct evidence of fish injury related to upstream passage at fish ladders; (4) Study fish passage at each ladder with a group of tagged test fish and/or radio tracking; (5) Monitor the possible unintended downstream-return of upstream-migrating fish ("fall back") over or through diversion dams using tagged fish and/or radio tracking studies; (6) Make underwater observations for congregations of adults below the dam and compare to ladder counts; (7) Monitor key hydraulic parameters continuously for Fail-Safe capabilities according to long-term Operations and Maintenance Plan and Facility Monitoring Plan.

TIMELINE: (1) Monitor video or electronic counters for three years. Pursuant to adaptive management protocols, if salmon and steelhead populations are insufficient to affirm ladder effectiveness under continuous duty, then video or electronic counting will be continued for a longer period of time by agreement of the Parties to be determined per protocols; (2) Conduct continuous monitoring of key hydraulic parameters for the term of the AMP.

TRIGGER EVENT: (1) Standards/guidelines, or Contemporary criteria, are changed and an evaluation of the existing ladder, according to Contemporary testing protocol, demonstrates a significant exceedence from the standards/guidelines/criteria; (2) Operations and maintenance activities indicate that facilities are not performing as designed; (3) Contemporary standards/guidelines, or future criteria, are not met, and/or there is direct evidence of impaired fish passage⁸⁶; (4) Direct evidence of salmon or steelhead injury from passage through fish ladders is observed; (5) Absence of spawning adults of species expected to distribute themselves in the higher elevation reaches of the stream, based on all observational data at times when there are sufficient populations of salmon and steelhead to observe, are observed for at least three years when no other barriers are identified.

RESPONSE: (1) If triggered by a change in standards/guidelines/criteria, refer matter to AMPT to determine response; (2) If triggered by a failure to perform as designed, then diagnose if there is direct evidence of impaired fish passage or injury; (3) If no direct evidence of impaired fish passage or injury, request a variance; (4) If triggered by unexpected spawner distribution (as defined in trigger event) then diagnose problem with appropriate tools such as tagged test fish or a radio tracking study; (5) If triggered by direct evidence of impaired fish passage or injury associated with fish ladders, then diagnose reason for the problem and modify or replace fish ladder or components.

RESPONSE LIMITS: All actions deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, will be implemented, provided that Consensus has been reached among the Parties and dedicated funding is available. If Consensus has not been reached, then appropriate actions will be determined through the dispute resolution process. Major project changes in facilities (e.g., new dam site, dam removal, major facility changes) would be subject to the FERC decision-making process.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: Conclude ladder effectiveness monitoring after three years with sufficient salmon and steelhead populations and no identified fish passage problems at particular fish ladder. Continue operations and maintenance monitoring for the term of the AMP. Salmon and steelhead counts at the ladder may continue as needed for basin wide biological studies.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: After transfer of facility from USBR to Licensee, Licensee assumes all costs for ladder repairs and replacements due to normal wear and tear, catastrophic damage, and any other type of damage, and will ensure that the ladders meet Fail-Safe criteria. Installation costs of new/additional facilities required to meet Contemporary criteria or modification of existing facilities to avoid fish injury or mortality would be paid by AMF protocols. However, in the event that the AMF is exhausted, the Licensee will pay up to the Licensee's Commitment for Authorized Modifications to project facilities and operations which are determined to be necessary under adaptive management. The following responsibilities also apply after transfer of the facility from USBR to Licensee. (1) Licensee will conduct and/or fund, up to the Licensee's Commitment, monitoring to ensure the effectiveness and continued reliable operation of ladders pursuant to the Facilities Monitoring Plan; (2) Continued monitoring specified as part of the adaptive management process would be funded according to adaptive management protocols; (3) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding for biological monitoring using ladder counts after the ladder is deemed effective.

⁸⁶ Direct evidence of impaired fish passage could include, but is not limited to, persistent or repeated plugging of the ladder with debris or persistent, abnormally high concentrations of salmon and steelhead below dams combined with low ladder counts.

Draft Adaptive Management Plan

PASSAGE OBJECTIVE 2

Provide reliable downstream passage of juveniles at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams per Contemporary criteria after the transfer of facilities to Licensee.

HYPOTHESIS: Implementation of facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities, will ensure that hydraulic parameters at fish screens meet Contemporary criteria at all times.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Use Contemporary NMFS criteria⁸⁷ or subsequent NMFS approved criteria. As per p 73490 in NMFS “4d Rule”; (2) Biological effectiveness of the screen relies on meeting Contemporary fish screen criteria as it has been affirmed to protect fish from injury and entrainment in applicable studies; (3) Measure, at various stream and diversion flows, hydraulic parameters such as approach and sweeping velocities, (4) Calculate flow rates for screen sections to verify approach and sweeping velocities; (5) Monitor key hydraulic parameters such as water surface elevation on both sides of fish screens continuously for Fail-Safe capabilities according to long-term Operations and Maintenance Plan and Facility Monitoring Plan; (6) Conduct visual observations of canals, during the course of other studies and especially at times when canals are dewatered, to check for possible entrainment.

TIMELINE: (1) Measure all relevant hydraulic parameters such as such as approach and sweeping velocities and water surface elevations at startup, and other appropriate times and flows as the facility ages, per the long-term Operations and Maintenance Plan; (2) Conduct continuous monitoring of water surface elevation on both sides of the fish screen for the term of the AMP.

TRIGGER EVENT: (1) Contemporary fish screen criteria is changed and an evaluation of the existing screen, according to Contemporary testing protocol, demonstrates a significant exceedence from the criteria; (2) Operations and maintenance activities indicate that facilities are not performing as designed; (3) Contemporary criteria is not met, and/or there is evidence of fish entrainment or injury.

RESPONSE: (1) If triggered by a change in NMFS criteria, refer matter to AMPT to determine response; (2) If triggered by a failure to perform as designed, then diagnose whether facility provides injury-free downstream passage of juvenile salmon and steelhead; (3) If facility provides injury-free downstream passage of juvenile salmon and steelhead, request a variance; (4) If evidence of fish entrainment or injury, then diagnose reason for the problem and modify or replace fish screens or components.

RESPONSE LIMITS: All actions deemed feasible, practical, reasonable, prudent, acceptable to the local community, and consistent with MOU and FERC protocols, will be implemented, provided that Consensus has been reached among the Parties and dedicated funding is available. If Consensus has not been reached, then appropriate actions will be determined through the dispute resolution process. Major project changes in facilities (e.g., new dam site, dam removal, major facility changes) would be subject to the FERC decision-making process.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: None.

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: The responsibility and funding of monitoring of key hydraulic parameters will be assigned in the Facilities Monitoring Plan. After transfer of facility from USBR to Licensee, Licensee assumes all costs for screen repairs and replacements due to normal wear and tear, catastrophic damage, and any other type of damage, and will ensure that the screens meet Fail-Safe criteria. Installation costs of new/additional facilities required to meet Contemporary criteria or modification of existing facilities to avoid fish injury or mortality would be paid by AMF protocols. However, in the event that the AMF is exhausted, the Licensee will pay up to the Licensee’s Commitment for Authorized Modifications to project facilities and operations which are determined to be necessary under adaptive management.

⁸⁷ For example, the Contemporary fish screening criteria used to generate this plan were adopted from NMFS Southwest Region “Fish Screening Criteria For Anadromous Salmonids, January 1997.”

PASSAGE OBJECTIVE 3

Provide reliable upstream passage of adult salmon and steelhead to their appropriate habitat over natural obstacles within the Restoration Project area while maintaining an appropriate level of spatial separation among the runs.

HYPOTHESIS: Implementation of instream flow levels and facilities modifications specified in the description of the Restoration Project, implementation of the Facilities Monitoring Plan, and implementation of any adaptive responses affecting instream flows or hydroelectric project facilities will ensure that natural instream barriers do not impede upstream migration of adult salmon and steelhead at prescribed flows and normal wet season flow regimes.

MONITORING AND DATA ASSESSMENT APPROACH: (1) Inspect potential barriers during annual surveys including photographic documentation and description; (2) Compare spawner distribution relative to suspected barriers; (3) Compare observed spawner distribution relative to expected spawner distribution for a particular species; (4) Use Contemporary methodologies that consider flow regime to identify actual barriers⁸⁸; and (5) Employ additional diagnostic studies as needed (e.g., radio tracking) if observed spawning differs relative to expected spawning distribution but no specific barrier is identified.

TIMELINE: Conduct continuous monitoring of natural potential barriers for the term of the AMP.

TRIGGER EVENT: An obstacle in the Restoration Project area is found to be unduly impeding adult salmon or steelhead migration under a range of flows including the prescribed instream flows.

RESPONSE: (1) Modify barrier, giving priority to those barriers that block large portions of a species' preferred habitat, while maintaining an appropriate level of spatial separation among the runs⁸⁹; (2) If barrier cannot be modified either in the short term or long term, acquire water to change instream flows, if appropriate, to levels that allow passage over natural barriers for the necessary times only.

RESPONSE LIMITS: All instream flow changes for salmon and steelhead passage deemed feasible, practical, reasonable, prudent, acceptable to the local community, and that are consistent with MOU and FERC protocols, will be implemented, provided that Consensus has been reached among the Parties. If Consensus has not been reached, then instream flow increases for salmon and steelhead passage will be determined through the dispute resolution process. If appropriate level of barrier modification is not feasible, then flow changes would be set to levels that allow passage over natural barriers for the necessary times only. Long-term and medium-term instream flow increases over the estimated flows for maximum usable habitat will provide not less than 90 percent of the maximum usable habitat. Short-term, pulsed instream flows may be set to higher levels that provide less than 90 percent of the maximum useable habitat for short periods of time.

RESPONSE EVALUATION: Per standard response evaluation described above.

END POINT: None

REPORTING: Per standard data management and reporting procedures described in Sections V.B. and V.C.3.

RESPONSIBILITY/FUNDING: (1) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding sources other than the Licensee for monitoring activities; (2) Resource Agencies will, subject to available funds, conduct and/or fund or seek funding sources other than the AMF or the Licensee for modification of barriers; (3) Water acquisition for increased instream flows downstream of Inskip, North Battle Creek Feeder, and Eagle Canyon diversion dams to facilitate fish passage will be funded by the WAF, AMF, Licensee up to the Licensee's Commitment, and/or others.

⁸⁸ For example, TRPA (1989) methodologies for barrier determination were used to generate this plan.

⁸⁹ Natural barriers within streams can provide many important ecosystem functions including restricting the movement of introduced fishes, acting as selective factors in the natural evolution of species, and separating subpopulations of native fishes. For example, sympatric races of chinook salmon generally segregate themselves by spawning at different times or in different locations within a stream. This spatial segregation is usually determined through interactions between flow and natural barriers. Removing some barriers could disrupt the natural factors controlling this natural segregation. For example, the spawning timing of spring-run chinook and fall-run chinook may overlap. However, spring-run typically migrate to spawning grounds at higher flows and may more easily pass obstacles at those flows. Spring-run chinook could be put in unnatural contact with fall-run chinook if barriers were removed which normally stop fall-run during the low flow season. Because of the many benefits of natural barriers, caution and careful analysis will characterize any decisions to remove natural barriers under Adaptive Management.

IV. LINKAGES WITH OTHER PROGRAMS

This technical chapter describes the linkages between the adaptive management of Restoration Project elements and state, federal, and private restoration programs and directives not directly related to the Restoration Project or with other Restoration Project planning that is not related to adaptive management. Table 10 provides a list of all the linkages discussed in this section.

Table 10. Linkages between the Adaptive Management of the Battle Creek Restoration Project and other planning or restoration programs and directives.

Restoration Project Planning	
Memorandum of Understanding	Construction Monitoring
Facilities Transfer Agreement	Facilities Monitoring Plan
Operations and Maintenance Plan	
Non-Project Restoration Programs In Battle Creek	
Conservation easements and conservation water rights	
Proposed fisheries management plan for the upper Sacramento River and tributaries	
Sacramento Corridor Habitat Restoration Assessment	
Proposed Coleman Powerhouse tailrace barrier construction	
Coleman National Fish Hatchery, water-supply intake modifications	
Coleman National Fish Hatchery, barrier dam modifications	
Coleman National Fish Hatchery, Hatchery and Genetic Management Plan	
Non-Project Restoration Programs Outside of Battle Creek	
CALFED Ecosystem Restoration Program.	
Comprehensive Monitoring, Assessment, and Research Program/CALFED Science Program	
Central Valley Project Improvement Act	
Anadromous Fish Restoration Program	
Comprehensive Assessment and Monitoring Program	
Recovery plans for threatened or endangered salmonids	
Central Valley Salmon and Steelhead Restoration and Enhancement Plan	
Upper Sacramento River Fisheries and Riparian Habitat Management Plan	
Restoring Central Valley Streams—A Plan for Action	
Steelhead Restoration and Management Plan for California.	
Delta and Sacramento River operations and monitoring	
Reference Watersheds	
U.S. Bureau of Land Management	
U.S. Forest Service	
Battle Creek Watershed Conservancy	
Local community participation	Sediment quality monitoring
Watershed assessment	Water temperature and climate monitoring
Data management and dissemination	
Non-Project Restoration Emergencies	
For example, hazardous spills/toxic leaks	

IV.A. Restoration Project Planning

This section details other planning elements of the Restoration Project to which the AMP is linked.

IV.A.1. Memorandum of Understanding

In June 1999, PG&E, NMFS, CDFG, USFWS, and USBR entered into an MOU that signaled the intent of these parties to pursue a salmon and steelhead restoration effort on Battle Creek that would modify the facilities and operations FERC Project No 1121. As stated throughout this document, the AMP is a direct product of the MOU. In addition to the AMP and its elements, the MOU also described all elements of the Restoration Project including physical changes to the hydroelectric project facilities and operation; definitions; purposes; roles and responsibilities; contingencies and limitations; planning, permitting, and construction activities; funding; provisions for lease or sale of FERC Project No. 1121; environmental liabilities; dispute resolution; term; and termination. While the AMP includes many of these same elements, questions about these elements, especially when they do not pertain to adaptive management, should rely on wording in the MOU or the amended FERC license for this project. In other words, the MOU prevails in any discrepancy between policy specified in the AMP and that set by the MOU.

IV.A.2. Construction Monitoring

USBR agrees to perform all construction monitoring and reporting as part of construction of the Restoration Project as described in MOU Sections 6.2 and 8.4. Funding for the construction monitoring will be derived only from the federal funding as identified in MOU Section 10.2, and USBR does not agree to spend any additional, federal money to perform such construction monitoring. Construction monitoring includes those parameters required by the permits developed pursuant to the Clean Water Act, and mitigation actions adopted pursuant to California Environmental Quality Act (CEQA), National Environmental Policy Act (NEPA), ESA, and related FERC requirements.⁹⁰

IV.A.3. Facilities Transfer Agreement

USBR agrees to perform all start-up and acceptance testing and prepare the necessary documents and reports, up to and until Licensee and USBR jointly determine that the constructed facilities' operation meets the design criteria. Completion inspections for each construction contract will be performed by both USBR and Licensee and certifications of approval will be issued jointly by USBR and Licensee. If construction of a particular Restoration Project feature does not meet with the satisfaction of either party, a checklist of needed work prior to the certification of completion will be

⁹⁰ MOU 7.1.A

Draft Adaptive Management Plan

prepared and agreed to by both parties. Upon mutual agreement of the parties, a completed portion of the construction contract or a Restoration Project feature may be turned over to Licensee for operation and maintenance.

Start-up and acceptance testing for both screens and ladders will include, but is not limited to, measurements of velocity and flow collected from each component of the structure at several stage heights to evaluate actual hydraulic performance and reliability over the full range of operating conditions as compared to the design specifications.⁹¹

IV.A.4 Facilities Monitoring Plan

Licensee, in consultation with the Resource Agencies, shall prepare a detailed facility monitoring plan to be submitted to FERC as part of the license amendment application. Licensee shall perform and assume the costs for the following facility monitoring:

- A. At the various outlet and spillway works for North Battle Creek Feeder, Eagle Canyon, Inskip, and Asbury Pump (Baldwin Creek) Diversion Dams, operate properly calibrated remote sensing devices that continuously measure and record total flow and the fluctuation of stage immediately below each dam during all operations for the purpose of verification of FERC license compliance. All flow and stage recording methodologies shall be approved by FERC;
- B. At the fish ladders at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams, operate properly calibrated remote sensing devices that continuously monitor water surface elevations at the top and bottom of the ladder to identify debris problems. In addition, continuously operate a calibrated automated fish counter or an underwater video camera to document fish movement through the ladder during the initial three-year period of operation, or as otherwise agreed upon by the Parties; and
- C. At the fish screens at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams, operate properly calibrated remote sensing devices that continuously monitor water surface elevation differences on the inlet and outlet side of screens to identify plugging.⁹²

IV.A.5 Operations and Maintenance Plan

USBR will work with Licensee as part of the design effort to create a Operations and Maintenance Plan that will be turned over to the Licensee at the time the restoration facilities are transferred from USBR to Licensee. The Operations and Maintenance Plan will include designers' operation criteria that give standards for safety and performance

⁹¹ MOU 7.1.B

⁹² MOU 7.2

limits for the new restoration facilities and a manual of standard operating procedures that explains how to operate the new restoration facilities.

IV.B. Non-Project Restoration Programs in Battle Creek

IV.B.1. Conservation Easements and Conservation Water Rights

TNC has established one conservation easement within the Battle Creek watershed as of October 2000 and is talking with several other landowners at this time about possibly acquiring others. The intended goals of this project are to limit future impacts of landscape fragmentation, instream physical disturbance, and the addition of new wells and septic systems; and to preserve high quality riparian habitat adjacent to wildlife compatible agriculture. TNC hypothesizes that the purchase of conservation easements in a watershed with at-risk native species will help maintain and enhance functional riparian habitat and stream-bank conditions, and will help minimize threats which stem from extensive human impacts, including water use.

TNC believes that the next important step in protecting salmon and steelhead along Battle Creek is protecting the relatively pristine riparian habitat along the stream from degradation and preventing the loss or degradation of its cold spring water by well development. In this project, TNC, working in partnership with the BCWC, plans to acquire conservation easement interests from willing landowners on resource-rich Battle Creek properties with potential for future development in order to provide conservation protection of natural processes while maintaining land in private agricultural use and ownership. It is intended that the terms of the easements will help ensure protection of the riparian habitat, will help prevent excessive water extraction and use, and will help ensure connectivity of the stream to the surrounding land, but may vary slightly to fit a particular property.

The U.S. Bureau of Land Management (BLM) has also acquired conservation easements on two properties in lower Battle Creek including land along the mouth of the stream. The purpose of these easements, acquired in October 2000, is to conduct riparian restoration activities along Battle Creek and the Sacramento River and to maintain the agricultural nature of these properties. BLM will be developing a conservation plan for these properties and anticipates implementing restoration activities during the next 15 to 20 years. While BLM is not actively seeking other conservation easements or land acquisitions in the Battle Creek watershed at this time, they will entertain proposals by willing sellers for new acquisitions or easements in the future.⁹³ The BCWC and local landowners have predicted that BLM land acquisition would increase public access to Battle Creek and likely heighten human impacts on sensitive populations of salmon and steelhead (R. Lee and B. McCampbell, presentations to the BCWG, 1998).

CDFG is currently exploring opportunities to obtain from willing sellers, conservation water rights from cold water sources. These conservation water rights

⁹³ Kelly Williams, BLM, pers. comm. 10/17/00.

Draft Adaptive Management Plan

would allow the natural flow of cold water from springs or seeps into the natural Battle Creek stream channel.

IV.B.2. U.S. Forest Service

All U.S. Forest Service (USFS) lands in the watershed are located in the upper Battle Creek watershed, upstream of the Restoration Project Area and outside the area that will be adaptively managed. However, the upper watershed is important in that its condition can potentially influence the quality of aquatic habitat in downstream reaches. The Lassen National Forest has been conducting a few limited programs in the upper Battle Creek watershed related to stream restoration and fuels assessment. These have included several road restoration measures such as culvert replacement, which are intended to reduce sediment delivery to the stream. In the summer of 2000, the USFS assessed wildfire fuels and aquatic/riparian habitat in the Battle Creek watershed under a contract with BCWC. Results of this assessment are expected in 2002.⁹⁴

IV.B.3. Proposed Comprehensive Fisheries Management Plan for the Upper Sacramento River and Tributaries

CDFG is beginning to draft a comprehensive fisheries management plan for the upper Sacramento River and tributaries in 2001. The objective of this plan is to take a watershed-wide, fisheries management-based view at production potential and population levels of all races of anadromous salmonids. Specific goals will be set for each upper Sacramento River tributary that will integrate the production potential of each stream, as well as the main river, from a system perspective. Perennial anadromous salmonid-producing tributaries that will be addressed in this plan include Clear, Cow, Cottonwood, Battle, Deer, Mill, and Antelope Creeks, while other streams that occasionally produce anadromous salmonids in good water years include Sulfur, Churn, and Bear Creeks. Questions regarding Battle Creek will be developed during this open planning process.

IV.B.4. Sacramento Corridor Habitat Restoration Assessment

The California Department of Water Resources (CDWR) will conduct, in cooperation with BLM, CDFG, TNC, a study of the geomorphic and riparian interactions occurring on an alluvial reach of the Sacramento River between the mouth of Cow Creek and Jelly's Ferry bridge (RM 280-267), including lower Battle Creek and Anderson Creek, to determine restoration possibilities for the integrated complex that includes lands owned and managed by the BLM, lands with conservation easements held by BLM, and other possible acquisitions by fee and/or conservation easements from willing sellers within this reach. This work will establish the existing conditions in the river reach for quantifiable attributes that could be monitored to evaluate the effects of land use improvements.

⁹⁴ Susan Chapelle, USFS, pers. comm. 6/28/00

IV.B.5. Coleman National Fish Hatchery Water-Supply Intake Modifications

The CNFH's water-supply intakes do not currently meet federal and state guidelines for the protection of salmonids at water diversions. A process to improve the intakes has been initiated by the USFWS.

Planning efforts have identified various intake alternatives to meet specific fish protection and flow requirements. The USFWS believes that the recommended alternative best meets the CNFH's needs, while also meeting the goals of the Restoration Project. Public involvement, as part of the environmental compliance and permitting activities, began in June 2000 under Phase I of the project. A draft Environmental Assessment/Initial Study will be prepared by the USBR. Permitting, design, and construction are anticipated to take three years to complete. Funds for construction are being sought.

Direct impacts from the construction of these modifications, as well as existing entrainment risks that might continue as late as 2003, may affect existing populations of fish in Battle Creek. These modifications are expected to benefit fish in the Restoration Project Area by eliminating any entrainment risks associated with the hatchery water-supply intakes and would protect the progeny of any adult fish that are allowed access to the Restoration Project Area as a result of the latter.

IV.B.6. Proposed Coleman Powerhouse Tailrace Barrier Construction

The AFRP identified the lack of a tailrace barrier downstream of the Coleman Powerhouse as a high-priority action item because of harmful false attraction of anadromous salmonids to powerhouse tailrace water (USFWS 1997). This action item has been linked to proposed modifications to the CNFH water-supply intakes and appears in each alternative being considered. The outcome of this analysis may determine the eventual action to be taken.

The multi-agency interim intake improvement subgroup (of the BCWG) has proposed installing a temporary fish rack as an interim solution to this problem. Problems with obtaining access to the site have delayed installation of the fish rack though a transfer of ownership from a private individual to the BLM should free up access to the site. Barrier construction is included as part of the CNFH Intake Improvements.

IV.B.7. Modifications to the Coleman National Fish Hatchery Barrier Dam

The barrier dam at CNFH is used primarily to collect fall-run chinook, late-fall-run chinook, and steelhead broodstock for the hatchery. The USFWS is presently funded by a 1999 CALFED grant to (1) more effectively block fall-run and late-fall-run chinook passage and (2) improve the upstream fish ladder to meet the same Contemporary criteria that will be applied to the improved hydro power facility ladders. The USFWS is

Draft Adaptive Management Plan

working with the USBR to determine the final design and future operations of this facility through the NEPA process.

Fish trapping facilities at this ladder will play an important part in several adaptive management objectives. Adult anadromous salmonids returning to the Restoration Project Area will be captured and sampled for such information as populations estimates, run-timing, stock, size, and condition. Future activities to monitor upstream migration of adults into the restored portion of the Battle Creek watershed can be modeled after monitoring conducted at this site by the USFWS office in Red Bluff since 1995 (USFWS 1996).

IV.B.8. Coleman National Fish Hatchery Biological Assessment and Associated Biological Opinion

The USFWS has recently completed a draft BA describing fish propagation programs at CNFH and assessing potential impacts resulting from those artificial propagation programs to naturally-produced salmonids. The primary purpose of the BA is to provide a single, comprehensive source of information to assess CNFH impacts, primarily to listed fish populations, resulting from artificial production programs. When finalized in the spring of 2001, the BA will be submitted to NMFS as part of the evaluation and permitting process required under ESA. NMFS will use the BA to generate a Biological Opinion, which will assess whether the proposed artificial production programs impart deleterious genetic or ecological effects on listed natural populations. If the BA is approved, the USFWS will enter into Section 7 consultation with NMFS to ensure proper implementation and systematic monitoring and reporting of results/effects.

The organizational structure of the BA follows the highly-detailed format of the NMFS's Hatchery and Genetic Management Plan. Furthermore, the BA is structured in a manner that incorporates and addresses comments and concerns generated through public and stakeholder participation in the CNFH reevaluation process (USFWS 2000b). The primary goal of the CNFH reevaluation process is to objectively review all aspects of hatchery facilities and operations, to ensure the integration with the AFRP-guided restoration efforts in Battle Creek. This broad-based reevaluation process is in addition to the ongoing hatchery evaluation program conducted by the USFWS's Red Bluff Fish and Wildlife Office (e.g., biological investigations and hatchery permitting BAs and enhancement permits). The four major components of the reevaluation process are:

- Compilation and analysis of historical hatchery operations and evaluation work;
- Determination of mitigation responsibilities;
- Analyzing potential impacts of current and proposed production programs on listed stocks of anadromous salmonids; and,

- Generating and analyzing potential management alternatives to minimize hatchery impacts on naturally-produced salmonid populations and compiling and analyzing historical hatchery operations and evaluation work.

Through the CNFH reevaluation process and the BA, the USFWS will address concerns regarding hatchery programs and activities that could potentially impact restoration of naturally-produced populations of anadromous salmonids in Battle Creek. Potential modifications to hatchery activities that are being examined through the CNFH reevaluation process, along with the adaptive management of hatchery operations, will be designed to minimize potentially negative impacts of hatchery activities to naturally-produced salmonid populations. Modifications to hatchery activities or facilities that may result from the CNFH reevaluation process may necessitate reinitiation of consultation with NMFS and amending or revising the BA for the CNFH.

IV.C. Non-Project Restoration Programs Outside Battle Creek

IV.C.1. CALFED Ecosystem Restoration Program

The Restoration Project is funded in large part by monies allocated as part of the implementation phase of CALFED's ERP. The ERP is organized into a matrix of visions that identify what the ERP will accomplish with its stated objectives, targets, and programmatic actions for an ecological process, habitat, species or species group, stressor, or geographical unit. The vision statements included in the ERP provide technical background to increase understanding of the ecosystem and its elements.⁹⁵ In light of the contribution of CALFED monies to the Restoration Project, ERP visions that are relevant to the Restoration Project, in terms of species or processes, are presented in Table 11. The adaptive management actions that will meet ERP visions will be identified.

⁹⁵ CALFED ERP Volume 1 page 1

Draft Adaptive Management Plan

Table 11. CALFED Ecosystem Restoration Program visions for ecosystem elements and how the Restoration Project and Adaptive Management Plan achieve these visions.

Element	ERP Vision	Achievement Method
Central Valley Streamflows	The ERP vision for Central Valley streamflows is to protect and enhance the ecological functions that are achieved through the physical and biological processes that operate within the stream channel and associated riparian and floodplain areas in order to contribute to the recovery of species and the overall health of the Bay-Delta.	The Restoration Project will substantially increase stream flows to meet the needs of ERP priority 1 fish species, chinook salmon and steelhead. The AMP contains protocols for changing these stream flows if necessary to increase chinook salmon and steelhead populations, chinook salmon and steelhead habitat, or assist chinook salmon and steelhead passage.
Stream Meander	The ERP vision for stream meander is to conserve and reestablish areas of active stream meander, where feasible, by implementing stream conservation programs, setting levees back, and reestablishing natural sediment supply to restore riverine and floodplain habitats for fish, wildlife, and plant communities.	By removing several diversion dams from Battle Creek, the Restoration Project will aid in the reestablishment of active stream meanders to the extent that Battle Creek and its tributaries meander naturally. Furthermore, agreements between Licensee and CDFG regarding enhancing the natural sediment supply and sediment routing in Battle Creek have been formalized in the past and will be pursued in the future.
Natural Floodplains and Flood Processes	The ERP vision for natural floodplains and flood processes is to conserve existing and intact floodplains and modify or remove barriers to over-bank flooding to reestablish aquatic, wetland, and riparian floodplain habitats.	By removing several diversion dams from Battle Creek, the Restoration Project will aid in the reestablishment of natural floodplains and flood processes, even though the FERC Project No. 1121 has historically had a relatively minor effect on natural flood flows.
Coarse Sediment Supply	The ERP vision for coarse sediment supply is to provide a sustained supply of alluvial sediments that are transported by rivers and streams and distributed to river bed deposits, floodplains, channel bars, riffles, shallow shoals, and mudflats, throughout the Sacramento-San Joaquin Valley, Delta, and Bay regions. This would contribute to habitat structure, function, and foodweb production throughout the ecosystem.	By removing several diversion dams from Battle Creek, the Restoration Project will prevent the loss of naturally-supplied sediment that can be stored in reservoir impoundments or removed from the system by reservoir dredging operations.
Central Valley Stream Temperatures	The ERP vision for Central Valley stream temperatures is to restore natural seasonal patterns of water temperature in streams, rivers, and the Delta to benefit aquatic species by protecting and improving ecological processes that regulate water	The Restoration Project will substantially increase instream flows, increase spring releases from hydroelectric project water collection facilities, and remove interbasin transfers of water to restore natural seasonal patterns of water temperatures in Battle Creek by protecting and improving ecological processes that regulate water. Furthermore, the AMP contains protocols for changing these stream flows if necessary to meet appropriate water temperature criteria.
Riparian and Riverine Aquatic	The ERP vision for riparian and riverine aquatic habitats is to increase their area and protect and improve their quality.	By removing several diversion dams from Battle Creek, increasing instream flows, and increasing cold water spring releases

Element	ERP Vision	Achievement Method
Habitats	Achieving this vision will assist in the recovery of special-status fish and wildlife populations and provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta. The ERP vision includes restoring native riparian communities ranging from valley oak woodland associated with higher, less frequently inundated floodplain elevations to willow scrub associated with low, frequently inundated floodplain elevation sites such as stream banks, point bars, and in-channel bars.	from hydroelectric project water collection facilities, the Restoration Project will improve riparian and riverine aquatic habitats. It is believed that higher instream flows will aid in the distribution of seeds from riparian plant species and elevate the dry-season water table in the riparian area fostering an expansion of riparian communities such as willow scrub.
Freshwater Fish Habitats	The ERP vision for freshwater fish habitats is to protect existing habitat from degradation or loss, to restore degraded habitats, and restore areas to a more natural state. Freshwater fish habitat will be increased to assist in the recovery of special-status plant, fish, and wildlife populations. Restoration will provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta.	By removing several diversion dams from Battle Creek, increasing instream flows, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to assist in the recovery of special-status plant, fish, and wildlife populations.
Essential Fish Habitats	The ERP vision for essential fish habitats is to maintain and improve the quality of existing habitats and to restore former habitats in order to support self-sustaining populations of chinook salmon.	By removing several diversion dams from Battle Creek, increasing instream flows, increasing cold water spring releases from hydroelectric project water collection facilities, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to assist in the recovery of self-sustaining populations of four races of chinook salmon.
Winter-Run Chinook Salmon	The ERP vision for winter-run chinook salmon is to recover this state- and federally-listed endangered species, achieve naturally spawning population levels that support and maintain ocean commercial and ocean and inland recreational fisheries, and that fully uses existing and restored habitats. This vision will contribute to the overall species diversity and richness of the Bay-Delta system and reduce conflict between protection for this species and other beneficial uses of water and land in the Central Valley.	By removing several diversion dams from Battle Creek, increasing instream flows, increasing flows from cold water springs, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to assist in the recovery of self-sustaining populations of winter-run chinook salmon. Fish passage facilities and prescribed minimum instream flows were determined in large part based on the needs of winter-run chinook salmon. Furthermore, the AMP contains protocols for changing these stream flows if necessary to specifically meet the habitat needs of winter-run chinook salmon.
Spring-Run Chinook Salmon	The ERP vision for spring-run chinook salmon is to recover this state- and federally-listed threatened species under the ESA, achieve naturally spawning population levels that support and maintain ocean commercial and ocean and inland	By removing several diversion dams from Battle Creek, increasing instream flows, increasing flows from cold water springs, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to

Draft Adaptive Management Plan

Element	ERP Vision	Achievement Method
	<p>recreational fisheries, and that fully use existing and restored habitats. This vision will contribute to the overall species diversity and richness of the Bay-Delta system and reduce conflict between protection for this species and other beneficial uses of water and land in the Central Valley.</p>	<p>assist in the recovery of self-sustaining populations of spring-run chinook salmon. Fish passage facilities and prescribed minimum instream flows were determined in large part based on the needs of spring-run chinook salmon. Furthermore, the AMP contains protocols for changing these stream flows if necessary to specifically meet the habitat needs of spring-run chinook salmon.</p>
<p>Late-Fall-Run Chinook Salmon</p>	<p>The ERP vision for late-fall-run chinook salmon is to recover this stock which is presently a candidate for listing under the ESA (it is included in the fall-run chinook salmon evolutionarily significant unit), achieve naturally spawning population levels that support and maintain ocean commercial and ocean and inland recreational fisheries, and that fully use existing and restored habitats. This vision will contribute to the overall species diversity and richness of the Bay-Delta system and reduce conflict between protection for this species and other beneficial uses of water and land in the Central Valley.</p>	<p>By removing several diversion dams from Battle Creek, increasing instream flows, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to assist in the recovery of self-sustaining populations of late-fall-run chinook salmon. Fish passage facilities and prescribed minimum instream flows were determined in large part based on the needs of late-fall-run chinook salmon. Furthermore, the AMP contains protocols for changing these stream flows if necessary to specifically meet the habitat needs of late-fall-run chinook salmon.</p>
<p>Fall-Run Chinook Salmon</p>	<p>The ERP vision for the fall-run chinook salmon evolutionarily significant unit is to recover all stocks presently a candidate for listing under the ESA achieve naturally spawning population levels that support and maintain ocean commercial and ocean and inland recreational fisheries, and that fully use existing and restored habitats. This vision will contribute to the overall species diversity and richness of the Bay-Delta system and reduce conflict between protection for this species and other beneficial uses of water and land in the Central Valley.</p>	<p>By removing several diversion dams from Battle Creek, increasing instream flows, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to assist in the recovery of self-sustaining populations of fall-run chinook salmon. Fish passage facilities and prescribed minimum instream flows were determined in consideration of the needs of fall-run chinook salmon. Furthermore, the AMP contains protocols for changing these stream flows if necessary to specifically meet the habitat needs of fall-run chinook salmon.</p>
<p>Steelhead Trout</p>	<p>The ERP vision for Central Valley steelhead trout is to recover this species listed as threatened under the ESA and achieve naturally spawning populations of sufficient size to support inland recreational fishing and that fully uses existing and restored habitat areas.</p>	<p>By removing several diversion dams from Battle Creek, increasing instream flows, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to assist in the recovery of self-sustaining populations of steelhead. Fish passage facilities and prescribed minimum instream flows were determined in large part based on the needs of steelhead. Furthermore, the AMP contains protocols for changing these stream flows if necessary to specifically meet the habitat needs of steelhead.</p>

Element	ERP Vision	Achievement Method
Anadromous Lampreys	The ERP vision for anadromous lampreys is to maintain and restore population distribution and abundance to higher levels than at present. The ERP vision is also to better understand life history and identify factors which influence abundance. Better knowledge of these species and restoration would ensure their long-term population sustainability.	By removing several diversion dams from Battle Creek, increasing instream flows, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats to assist in the recovery of self-sustaining populations of anadromous lamprey. Furthermore, monitoring approaches within the AMP will contribute to gaining a better understanding of the life history identify factors which influence the abundance of anadromous lamprey.
Native Resident Fish Species	The ERP vision for resident fish species is to maintain and restore the distribution and abundance of native species, such as Sacramento blackfish, hardhead, and tule perch to contribute to the overall species richness and diversity. Achieving this vision will reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.	By removing several diversion dams from Battle Creek, increasing instream flows, and providing improved fish passage facilities, the Restoration Project will restore degraded freshwater fish habitats and should assist the restoration of the distribution and abundance of native fish species in Battle Creek.

**IV.C.1.a. Comprehensive Monitoring, Assessment, and Research Program/
CALFED Science Program**

In 1998, CALFED approved and funded a joint San Francisco Estuary Institute, Interagency Ecological Program, U.S. Geological Survey proposal to develop a Comprehensive Monitoring, Assessment, and Research Program (CMARP) for CALFED and its member agencies. The proposed CMARP addresses eight CALFED program elements and actions to be implemented over the next 30 years including long-term levee protection, water quality, ecosystem restoration, water use efficiency, water transfer framework, watershed management coordination, and delta conveyance and storage.

One of the primary goals of CMARP has been the design and implementation of a monitoring program with several modules that overlap with the Restoration Project in Battle Creek. Compliance monitoring provides information needed to determine if activities are meeting permit or other regulatory requirements. Model verification monitoring provides information to evaluate management alternatives, e.g., for adaptive management. Trend monitoring helps identify long-term changes occurring as a result of human and natural factors. The following have been components of the CMARP monitoring program: an inventory of existing monitoring programs, the development of specific monitoring elements, the development of a process for data management, and the development of a process for data assessment and reporting.

CMARP (soon to be renamed CALFED Science Program) is currently developing aquatic and terrestrial baseline monitoring programs to provide information needed by CALFED managers and scientists to follow trends in key indicators of the status and trends of Bay/Delta and Central Valley ecosystems and several sensitive plant and

Draft Adaptive Management Plan

animals. Geographically, the recommended aquatic resources baseline program will extend from the bases of the major dams through the Bay/Delta and into the near-shore ocean. The program will include ecosystem processes as well as specific elements directed to listed and special status fish species such as chinook salmon, steelhead, delta smelt, splittail, and green and white sturgeon.

The foundation of the proposed baseline will be built on many of the existing monitoring efforts being conducted under the auspices of CVPIA, CAMP, the Interagency Ecological Program, the Sacramento Watershed Group, the San Francisco Estuary Institute's Regional Monitoring Program, and agency-funded tributary monitoring on the Feather, American, and Tuolumne Rivers and on Battle, Deer, Mill, and Butte Creeks. The monitoring program report will identify data gaps and recommend new elements to fill those gaps.

The recommended plan was to be sent to CALFED with the goal of identifying and agreeing on the program elements at a later date. If CALFED approves the plan, the monitoring program will go into effect during the fall of 2001, with the new elements funded as money becomes available through the budget process. The report will contain chapters on data management (recommend use of the IEP Bay/Delta and tributaries data base), communications/coordination among the program participants, and data conversion and information transfer to decision makers.

Monitoring and data assessment results from the Battle Creek adaptive management program will be shared with CMARP/CALFED Science Program. Data collections and analyses as part of the AMP will be coordinated with the larger aims of CMARP/CALFED Science Program.

IV.C.2. Central Valley Project Improvement Act

The Central Valley Project Improvement Act of 1992 (H.R. 429 "Reclamation Projects Authorization and Adjustments Act of 1992: Title XXXIV—Central Valley Project Improvement Act") was enacted to provide funds for fisheries restoration. The CVPIA mandated changes in Central Valley Project (CVP) management in order to protect, restore, and enhance fish and wildlife habitat. In particular, the act stated "The mitigation for fish and wildlife losses incurred as a result of construction, operation, or maintenance of the CVP shall be based on the replacement of ecologically equivalent habitat" and that first priority shall be given to "measures which protect and restore natural channel and riparian habitat values."

IV.C.2.a. Anadromous Fish Restoration Program

To meet provisions of this act, the USFWS developed the AFRP (USFWS 1997), which identified 12 actions that would help restore anadromous fish to Battle Creek, including increasing instream flows past PG&E's hydropower diversions and installing effective fish screens and ladders. Additionally, the CVPIA has sought to minimize fish losses incurred as a result of operations or maintenance of any element of the CVP,

including the CNFH in Battle Creek, and specifies that habitat replacement, rather than hatchery production, is the preferred means of mitigating for unavoidable losses.

Of the 12 proposed actions listed in the AFRP, five have been implemented, three are elements of the Restoration Project, and four are yet to be implemented (AFRP Implementation Plan available at <http://www2.delta.dfg.ca.gov/afrp/>). The outstanding AFRP elements include improved management of the barrier dam for salmon passage now that a disease-safe water supply has become available to the CNFH, screening the Coleman Powerhouse tailrace and the CNFH water-supply intakes, and developing a comprehensive restoration plan for Battle Creek that integrates CNFH operations. These four proposed actions should be completed through the programs listed in the above section entitled “Non-Project Restoration Programs in Battle Creek.”

IV.C.2.b. Comprehensive Assessment and Monitoring Program

The CAMP was also established in response to the CVPIA. A section of the CVPIA directed the Secretary of the Interior to develop a program to evaluate the effectiveness of actions designed to ensure that by the year 2002, the natural production of anadromous fish in Central Valley streams is sustainable, on a long-term basis, at levels not less than twice the average levels attained during 1967-1991. The anadromous species included in CAMP are fall-run chinook salmon, late fall-run chinook salmon, winter-run chinook salmon, spring-run chinook salmon, steelhead trout, American shad, striped bass, white sturgeon, and green sturgeon. The categories of anadromous fish restoration actions evaluated by CAMP for their effectiveness in doubling natural production are habitat restoration, water management, fish screens, and structural modifications.

CAMP assesses both the cumulative and relative effectiveness of restoration actions on anadromous fish production. The cumulative effectiveness of restoration actions is evaluated by monitoring adult production of each species and comparing the estimated natural adult production to the target natural adult production (i.e., the anadromous fish doubling goals). The relative effectiveness of restoration actions is evaluated by monitoring juvenile abundance of chinook salmon in relation to when and where restoration actions are implemented. Adult and juvenile data collected for CAMP are compiled regularly and made available on the Internet and in published reports.

CAMP monitoring focuses on estimating juvenile production and counts of adults. While CAMP does fund some monitoring projects, it primarily acts as a guide to other studies by maintaining protocols for fisheries research that allow for the development of a Central Valley-wide understanding of anadromous fish restoration. Applicable data collected as part of the Restoration Project and adaptive management will follow CAMP protocols to facilitate the understanding of the Restoration Project contribution to reaching CVPIA goals.

Draft Adaptive Management Plan

IV.C.3. Recovery Plans for Threatened or Endangered Salmonids

NMFS prepared a recovery plan for winter-run chinook salmon which identified and set priorities for actions necessary to ultimately restore the Sacramento River winter-run chinook salmon as a naturally sustaining population throughout its present range. More immediately, the plan identified actions to prevent any further erosion of the population's viability and its genetic integrity. The recovery plan also included a description of site-specific management actions necessary for recovery, objective, measurable criteria, which when met, will allow delisting of the species, and estimates of the time and cost to carry out the recommended recovery measures. Finally, the recovery plan specified Battle Creek as a site for the potential restoration of self-sustaining populations of winter-run chinook salmon.

NMFS is currently in the process of preparing a recovery plan for steelhead and is planning to prepare a recovery plan for spring-run chinook salmon. The recovery plan for spring-run chinook salmon would likely be prepared jointly with CDFG. Much of these plans would likely be based on CALFED's EIS/EIR, its Multi-Species Conservation Plan, and the Ecosystem Restoration Plan. No timeline has been set for the completion of these plans.

These recovery plans would link to the Restoration Project by setting numerical goals for viable population levels for three of the species targeted for restoration. These documents would likely not include any binding mandates or prescriptions to be specifically implemented in Battle Creek.

IV.C.4. Central Valley Salmon and Steelhead Restoration and Enhancement Plan

In the early 1990s, the Central Valley Salmon and Steelhead Restoration and Enhancement Plan was developed to restore and enhance salmon and steelhead in the Central Valley (CDFG 1990). This plan called for increased instream flows and effective fish screens on Battle Creek. The implementation of the Restoration Project will meet all the recommendations in this plan that were specific to Battle Creek.

IV.C.5. Upper Sacramento River Fisheries and Riparian Habitat Management Plan

The Upper Sacramento River Fisheries and Riparian Habitat Advisory Council's 1989 Plan singled out Battle Creek as a key watershed for restoration. Goals of this plan will be achieved with the implementation of the Restoration Project and the AMP.

IV.C.6. Restoring Central Valley Streams—A Plan for Action

CDFG's (1993) "Restoring Central Valley Streams—A Plan for Action" focused on the potential for restoring winter-run and spring-run chinook salmon and steelhead to Battle Creek by the preparation and implementation of a comprehensive restoration plan

for anadromous fish in Battle Creek, increasing instream flows, and revised management of the barrier dam at CNFH. The planning recommendations of “A Plan for Action” have already been achieved with the development of the Restoration Plan (Ward and Kier 1999a) and the MOU. Implementation of the Restoration Project and the AMP will meet “A Plan for Action’s” goals of increasing instream flows. Finally, the goal of revising management of the barrier dam will be based on USFWS’ Hatchery and Genetic Management Plan for the CNFH and CDFG’s proposed comprehensive fisheries management plan for the upper Sacramento River and tributaries.

IV.C.7. Steelhead Restoration and Management Plan for California

The Steelhead Restoration and Management Plan was prepared by CDFG in 1996 as a follow-up to its “A Plan for Action” stemming from the final recommendations of the California Advisory Committee on Salmon and Steelhead Trout. Several of the actions identified in this document that pertained to the Battle Creek watershed will be implemented through the Restoration Project.

IV.C.8. Delta and Sacramento River Operations and Monitoring

Water diversions from the Sacramento River downstream of Battle Creek, including Red Bluff Diversion Dam and about 300 others, have been identified as causing problems for fish passage (CDFG 1990). Especially harmful for fish populations from the upper Sacramento River Basin are the many unscreened water diversions which can entrain juvenile and adult fish (CDFG 1990). Perhaps the most commonly cited factor negatively affecting populations of salmon and steelhead from Sacramento River tributaries such as Battle Creek is the operation of water pumping plants by state and federal agencies, as well as smaller water diversions, within the Sacramento/San Joaquin Bay-Delta (CDFG 1990). These pumps cause problems with the magnitude and direction of flow, tidal cycles, fish entrainment, salinity and water quality, and fish migration (CDFG 1990).

Seeking solutions to the resource problems in the Bay-Delta, state and federal agencies signed a Framework Agreement in June of 1994 that provided increased coordination and communication for environmental protection and water supply dependability. The Framework Agreement laid the foundation for the Bay-Delta Accord and the CALFED Bay-Delta Program. A programmatic environmental impact statement was released in June 2000 which detailed specific actions regarding how water supply operations will be coordinated with endangered species protections and water quality, and which developed long-term solutions to fish and wildlife, water supply reliability and flood control, and water quality problems in the Bay-Delta.

The well-intended steps proposed in these planning documents may have beneficial affects on fish populations from Battle Creek and should aid the Restoration Project in restoring anadromous fish to Battle Creek. However, it is possible that diversions in the Bay-Delta and Sacramento River will continue to harm fish populations from Upper Sacramento River tributaries. If that happens, salmon and steelhead

Draft Adaptive Management Plan

restoration in Battle Creek could be confounded. The adaptive management studies in the AMP have been designed to identify those impacts on Battle Creek fish caused by the hydroelectric project and to tell when factors from outside the watershed are at play. However, the AMP will not be able to rectify extra-watershed limiting factors.

IV.C.9. Reference Watersheds

Monitoring relevant to this AMP is routinely conducted in the Deer, Mill, and Butte Creek Reference Watersheds. With some variations in specific methodologies, population estimates of adult fall-run and spring-run chinook salmon, and estimates of juvenile chinook salmon production, are generated annually in each of these watersheds. From these estimates, CRRs are routinely calculated. Other fish population data either recently collected or anticipated in the near future includes genetic sampling of spring-run and fall-run chinook, life history details of juvenile chinook, and age/growth information from otolith sampling.

Fish habitat is monitored in these streams, especially in the high-elevation habitat of spring-run chinook. Also, water temperature and water quality monitoring is routinely conducted in Deer, Mill, and Butte Creeks.

The monitoring of adult counts and juvenile production are both part of long-term state and federal programs that are expected to continue well into the future. However, other fish population data has received directed funding that may not be available in the future. Data about fish populations, habitat, and water temperature/quality collected in these Reference Watersheds will be directly compared with similar data from Battle Creek as a means of measuring attainment of several objectives within the AMP.

IV.D. Battle Creek Watershed Conservancy

IV.D.1. Potential Local Community Participation

In general, the stream systems of the upper watershed are in good health; fisheries, water, and land management activities occurring in these streams have had little impact on the potential to restore anadromous salmonids to the lower Battle Creek watershed. While several fisheries, land, and water management actions in the upper watershed affect resident populations of fish, these effects are usually localized and attenuated by the time Battle Creek flows into anadromous fish habitat. Some of these actions include fish stocking in streams and reservoirs of the upper watershed for recreational fishing, timber harvest on private and public lands primarily in the headwaters areas, cattle grazing in or near riparian ecosystems, and hydroelectric power development (Ward and Kier 1999a).

Nonetheless, several possible land use activities that could affect restoration of salmon and steelhead have been identified. Agricultural use of surface waters may affect anadromous fish habitat if water quality and temperature are impacted. Catastrophic wild fires in the uplands surrounding the anadromous fish habitat of Battle Creek could

devegetate vast areas of land exposing significant amounts of soil to erosive processes which might then carry sediment to fish habitat in Battle Creek (Wissmar et al. 1994; see Spence et al. 1996 for a review of the effects of wildfires on salmonids). Chemical fire retardants needed to suppress wild fires have also been identified as impacting water quality and killing fish (Norris and Webb 1989).

Furthermore, current trends throughout the American West indicate that as the economics within Battle Creek shift and as more people seek land in rural areas, it is likely that large land holdings will be subdivided and sold to multiple owners (Rudzitis 1996; Power 1996) leading to more complicated political and land management scenarios which will likely impact the ability to restore or maintain salmon and steelhead populations. The present land use and ownership patterns have been identified by CDFG as the best for the restoration of anadromous fish populations compared with the identified alternatives (CDFG 1997).

Neither the AMP nor any single agency initiative will be addressing any of these issues despite the fact that land use, and the attitudes toward restoration held by local landowners, will play a critical role in the restoration of anadromous salmonids to Battle Creek. The BCWC, in as much as it is motivated and funded to do so, will be the organization most suited to protecting Battle Creek and its fish populations from deleterious land use practices, primarily through education, outreach, physical projects, and monitoring.

Perhaps most importantly, the BCWC is best suited to foster long-term acceptance of the Restoration Project by the local community, which will be a critical component to the success of adaptive management and the Restoration Project. The perception of the Restoration Project by local community members ranges from “it’s a government imposed burden” to “it’s a worthy project that we want to help.” If the BCWC and the MOU parties can work together to successfully implement the Restoration Project, then the challenge will be to give members of the local community a reason to embrace the Restoration Project. The BCWC has suggested that if the local community is encouraged to participate in adaptive management monitoring and data management, then community acceptance, a sense of ownership in the outcome of the project, and the eventual success of the Restoration Project is far more assured than if the Restoration Project excludes local input and salmonid restoration is seen as something to be actively resisted.

As a private organization with no statutory responsibility, the BCWC will have no responsibility to enforce provisions or policy associated with the Restoration Project. However, it may assist in a preventative role, helping to identify potential problems between land owners and Restoration Project policy, and helping to ameliorate these problems through technical assistance, assistance in getting grant money for on-the-ground work, and through liaison with the agencies. For example, landowners are often reluctant to consult with agencies charged with enforcement since they feel there is a chance they may be punished. The BCWC can continue to act as a go-between in such cases, with the result that the issue is addressed and a problem solved.

Draft Adaptive Management Plan

IV.D.2. Suggested Monitoring Tasks

Inasmuch as it is motivated and funded to do so, the BCWC, with participation from local schools, may be the organization most suited to monitoring certain aspects of the watershed that either fall within, or are complementary to, this AMP. The BCWC hopes the Parties will encourage their participation in the following activities.

IV.D.2.a. Sediment Quality Monitoring

One of the most easily measured symptoms of deleterious land use practices would be an increase in sedimentation within Battle Creek. The BCWC could partner with local schools to initiate sediment quality monitoring. Through relatively simple scientific sampling regimes, young residents of the watershed could provide an early-warning system for the health of the Battle Creek uplands while learning about and forming a connection with the unique populations of salmon and steelhead that will be restored in their watershed.

IV.D.2.b. Ongoing Watershed Assessment

Sediment quality monitoring is useful in detecting erosion problems after they occur. The BCWC feels that a locally developed, long-term, watershed assessment program would be able to prevent erosion problems before they occur or, at least, before they affect stream habitat in the Restoration Project Area. By working with private landowners in the upper watershed, the BCWC could help landowners implement appropriate land-use practices that would protect against ecological impacts and would prevent the need for future regulatory actions.

IV.D.2.c. Water Temperature and Climate Monitoring

Water temperature and climate monitoring are included within this AMP and are activities that might be done efficiently and cost-effectively by the BCWC. Depending on interest by the BCWC, it may be possible for the Resource Agencies to train and fund the BCWC to collect this critical information. Some private landowners may not allow access to Battle Creek for monitoring by Resource Agency personnel, but would be much happier to allow a member of the community on their property. In these situations, it is possible that key adaptive management monitoring elements, like temperature monitoring, would only be feasible with the support and participation of the local community.

IV.D.2.d. Data Management and Dissemination

The BCWC operates and maintains an information system in which data collected as part of the Restoration Project can be stored and/or disseminated. This existing system affords the BCWC and local community members the ability to monitor changes in the watershed as well as assess the effects of those changes on the fish populations and habitat in the Restoration Project Area. This system complements and, in many respects,

outperforms agency-maintained databases which are designed more for Central Valley-wide applications, rather than the fine-scaled effects most important to adaptive management. The BCWC foresees using this information system as a critical way to assist in the adaptive management process.

IV.E. Non-Restoration Project Emergencies

Emergencies in the Battle Creek watershed that could affect the restoration of salmon and steelhead, but that are not directly related to the Restoration Project (e.g., hazardous spills or toxic leaks), would be addressed by standard, official channels. The AMTT would be available to consult with the interested parties as to the possible impacts these types of emergencies may have on the fish or habitat in the Restoration Project.

V. PROTOCOLS

V.A. Adaptive Management Activities on Private Land

Extensive field investigations will be conducted by the Parties to implement the objectives of the AMP. Much of this work may be conducted on private land or access to sampling sites may require travel across private land. To respect landowner rights, all adaptive management activities on private land will follow these protocols.

A Shasta or Tehama County representative of either CDFG or USFWS will coordinate all adaptive management field activities undertaken by the Parties or their agents by serving as, or designating, a Point of Contact (POC). The activities coordinated by the POC may include, but are not limited to, field surveys, site visits, and construction work associated with adaptive responses. The POC will work with Field Coordinators designated by each of the Parties. The POC will serve as the primary contact person for the public and will coordinate and be responsible for the maintenance and renegotiation of landowner agreements and right-of-way easements established by the USBR during Restoration Project initiation. A standard landowner agreement and easement form will be developed by the AMTT with the help of the BCWC that could be modified in any way to meet individual landowner needs. The POC will develop Contemporary communications tools such as a telephone “hotline” and/or web site to provide timely and complete information to landowners and other parties interested in adaptive management activities.

Field Coordinators will be responsible for coordinating all field investigations and adaptive management activities conducted by the members or agents of their respective agency. Field Coordinators will also assist the POC by interfacing with the public. For instance, they will be responsible for notifying landowners of activities on individual private lands.

A seasonal schedule of all adaptive management activities conducted by any of the Parties or their agents will be maintained by the POC. This schedule, and any

Draft Adaptive Management Plan

updates, will be distributed by the POC to all Field Coordinators, affected landowners, hydroelectric project operators designated by the Licensee, appropriate CDFG and NMFS wardens or enforcement officers, representatives of the BCWC, CALFED, and any person requesting such notification.⁹⁶ Day-to-day changes in field scheduling approved by Field Coordinators will be communicated by Field Coordinators directly to the POC, affected landowners, hydroelectric project operators designated by the Licensee, and appropriate CDFG and NMFS wardens or enforcement officers.

The POC will accompany all field personnel at least during the initial field surveys each year. The POC's presence during subsequent surveys will be decided at the time of those later surveys.

Adaptive Management activities will only be performed within the Restoration Project Area. All field personnel must adhere to the following guidelines when performing Adaptive Management activities in Battle Creek:

- (1) Minimize the number of field trips into the Battle Creek watershed by combining monitoring activities and coordinating schedules with other agencies/field teams.
- (2) Field work activities must be conducted safely. For example, field personnel will always work in teams of two or more. In case of any emergency, contact the Licensee's designated emergency number or hydroelectric project operator.
- (3) Field personnel will honor and respect all landowner agreements or right-of-way easements and should carpool as much as possible to minimize disturbance to the landowners and their property.
- (4) All road gates will be left the way they are found (i.e., if a gate is found open, it will be left open; if a gate is found closed, it will be left closed after passing through, regardless of the duration of activities within the gated area.
- (5) Roads will not be damaged by driving on them when they are too wet or soft. Field personnel will walk when roads are wet, and will photograph and document any road damage that may occur and report the incident to the Field Coordinator. If field personnel find a road with existing soil disturbance (e.g., rutting, erosion, etc.), it will not be used and it will be documented and reported to the POC by the Field Coordinator.
- (6) All agency personnel going into the field must carry official photo identification (e.g., valid driver's license) and must freely offer it to any property owner or employee who requests it.
- (7) Field personnel will be required to sign entry logs at or near the point of entry for each site if required by property owners.

⁹⁶ From MOU 9.A.1

- (8) All field supplies brought into a site must also be removed including field equipment (except long-term monitoring equipment approved by affected landowners), personal belongings, or garbage.
- (9) Fire damage is a real and serious concern. Field crews will check with the Field Coordinator for the current fire hazard status before performing fieldwork. Field crews will avoid motorized vehicular access during periods of extreme fire hazard as determined by the Field Coordinator. There will be no smoking at any time on any private property. Vehicles should have a fire extinguisher and a shovel. No vehicles will be parked where grass or other vegetation might contact the underside of the vehicle. Evidence of fires possibly triggered by field personnel (e.g., burning odors, smoke) will be investigated immediately and reported if necessary.
- (10) Field personnel have no right to recreational or personal use of any private property. Pets are not to be taken into the field and onto private property. Only personnel authorized by Field Coordinators may accompany field crews on any private property.
- (11) Field personnel will record only data that meets the purpose of the visit. Incidental observations will not be recorded or shared with the public, but may be shared with the landowner upon request at any time. Field personnel will not discuss specifics of data collected from private properties with anyone outside of the staff designated by the AMP data management protocols.

V.B. Data Management

It will be the responsibility of any Party collecting and/or funding the collection of data as part of Adaptive Management monitoring to ensure that the following data management protocols are carried out. All data collected as part of Adaptive Management monitoring will be:

- Collected according to scientifically sound protocols developed by the agencies collecting or funding data collection;
- Collected following AMP protocols for data collection on private lands;
- Validated using scientifically sound quality assurance and quality control procedures before being released to the public or other agencies, or used in decision making;
- Include information consistent with CMARP, EPA, or other Contemporary standards;
- Stored and/or disseminated in an appropriate agency information system that is publicly accessible which provides for public distribution of information; and
- Transmitted to the BCWC for storage and/or dissemination in an information system operated and maintained by the BCWC and will include metadata and

Draft Adaptive Management Plan

narrative descriptions of the goals, objectives, methodology of data collection, and a description of the limitations on the use of the data.

Contemporary CMARP and EPA data collection standards encourage the collection of the following information: date; time; station code; GPS (global positioning system) coordinates; species; length; length criteria; marks or tags; life stage; plus count; live/dead; effort information; trapping efficiency; basic water quality data such as temperature, turbidity, flow; and metadata. Adaptive Management data collection and storage standards may change to meet any changes in Contemporary standards.

V.C. Process

V.C.1. Meeting Schedule

Regular meetings of the AMTT will be scheduled four times per year to allow data collection scheduling in accordance with fish life-history requirements and funds management. In addition to considerations of grant scheduling and funding, each regular meeting will address any possible adaptive management actions that need to be taken immediately. All regularly scheduled meetings of the AMTT will be open to the public.

At an AMTT meeting to be held in **October**, summary reports will be presented by each Party responsible for collecting data in the preceding field season. These data reports will be used to prioritize any possible adaptive management responses and will be the foundation for the preparation of a draft annual report. The draft annual report will be presented and discussed at a meeting to be held in **January**. The draft annual report will be presented and discussed at an annual stakeholders meeting in **February**. The final annual report will be presented and discussed at a regular meeting in **March**. At this time, the annual report will be ready for submittal to AMPT. Field study and data collection will also be coordinated at the March meeting.

All regularly scheduled meetings of the AMPT will be open to the public. The AMPT will meet regularly, at least once per year. The annual meeting will be held in **late March** and consist of two purposes. The first purpose will be primarily directed at budget review, funds management, and approval of the annual adaptive management report in time to meet funding agency deadlines. The second purpose will be to provide updates to stakeholders and for public presentation and comment of the annual report. This meeting will be formally announced to the public according to the specific public announcement protocols.

Ad hoc meetings of either the AMTT or AMPT may be scheduled as needed, following the specified adaptive management decision making protocols. Ad hoc meetings called in response to emergency conditions may be conducted in person or with the aid of telecommunications, as determined at the time of the emergency by either the AMTT and/or AMPT. Advance public notice requirements specified for regular meetings of the AMPT need not be implemented for ad hoc meetings of the AMPT in the case of emergencies. Ad hoc meetings of the AMPT scheduled for a specific emergency and not announced with a formal public notice, will consider only issues pertinent to the

emergency at hand and will not make decisions on issues normally addressed at regular meetings. All ad hoc meetings of the AMTT and AMPT will be open to the public.

V.C.2. Meeting Process

Annual meetings of the AMPT and regularly scheduled AMTT meetings will be formally announced to all Parties, the BCWC, CALFED, and any person requesting such notification.⁹⁷ Chairpersons of the AMPT and AMTT will provide certified notice of regularly scheduled meetings at least one month in advance to Party representatives of their respective team and representatives of the BCWC, CALFED, and any person requesting such notification.⁹⁷ Members of each team then have one week to respond with suggestions for the meeting agenda, which will be circulated by the Chairperson to representatives of each Party and representatives of the BCWC, CALFED, and any person requesting such notification.⁹⁷

The annual AMPT meeting and ad hoc meetings of the AMPT that are not scheduled in direct response to an emergency will be formally announced to the public. The scheduled meeting location and time and the meeting agenda will be published a minimum of three times, at least two weeks before scheduled meetings, in major newspapers or other Contemporary standard media in Shasta and Tehama Counties. Interested persons may attend any meeting, contribute to discussions, and provide suggestions regarding implementation of the AMP.⁹⁸

At least one representative from each of the Parties will be required to attend regularly scheduled and ad-hoc meetings announced according to the aforementioned process or to provide a proxy. A proxy may be transmitted electronically if followed by a document meeting Contemporary formal documentation standards adopted by the AMPT. To ensure that absenteeism does not impede the decision-making process, if a Party or Parties is not represented in person or by proxy at regularly scheduled and ad-hoc meetings announced according to the aforementioned process, and unless a written proxy from the absent party conforming to Contemporary formal documentation standards is received by the Chairperson of the meeting within two weeks, then the dispute resolution process will be triggered.

The Chairs of the AMPT and AMTT will be held by a representative of one of the Parties. Each Chair will rotate annually among the four Parties such that no Party will be the Chair of one team more than once in any four-year period. Furthermore, the Chair for the AMTT will always represent a different Party than the Chair for the AMPT so that the Chairpersons of the AMTT and the AMPT are never representatives of the same Party at any given time.⁹⁹ A Chairperson-elect will be appointed for each team to succeed the Chairperson at the expiration of the Chairperson's one-year term. This appointment must consider the Chairperson rotation protocols set forth in this paragraph.

⁹⁷ MOU 9.A.1

⁹⁸ MOU 9.A.1

⁹⁹ Sense of MOU 9.B.1 and 2

Draft Adaptive Management Plan

All decisions made by the AMTT and AMPT will be made by voting representatives of each Party at regularly scheduled or ad hoc meetings according to the aforementioned notification and absentee rules. All decisions made by the AMTT must be made by Consensus or will be referred to the AMPT. All decisions made by the AMPT will conform to the following possible outcomes:

- A 4-to-0 vote (Consensus) carries the motion;
- A 3-to-1 vote triggers dispute resolution protocols;
- A 2-to-2 vote leads to further discussion.
- A 3-to-0 vote (absenteeism or abstention) triggers dispute resolution.

V.C.3. Reporting

An adaptive management report will be prepared each year by the AMTT and approved by the AMPT. This annual report will document monitoring and data assessment approaches and results from the previous year, identify any possible trigger events that occurred which require an adaptive response, propose the adaptive response to be taken, report on results of adaptive responses taken since the most recent report, and evaluate spending guidelines involved in categorizing major, minor, and emergency responses. This report may also include any other diagnostic studies conducted as part of adaptive responses. Documentation of monitoring and data assessment approaches and other diagnostic studies will be achieved by compiling field study reports prepared by the Parties that conducted or funded individual field studies. The compilation of these field study reports, as well as preparation of report sections identifying trigger events and adaptive responses, will be conducted under the joint oversight of the AMTT and AMPT Chairpersons or their designates. The annual adaptive management report will be presented at the annual meeting of the AMPT, to the BCWC, BCWG, and other stakeholders.

V.C.4. Adaptive Response Process

After a trigger event has occurred, one of three types of adaptive responses will follow: Major, Minor, or Emergency Responses. Major Responses are defined as non-emergency changes to hydroelectric project facilities and/or flow operations that exceed a value of \$25,000, adjusted for inflation from the date of this agreement. Minor Responses are defined as non-emergency changes to hydroelectric project facilities and/or flow operations that are less than a value of \$25,000, adjusted for inflation from the date of this agreement. Emergency Responses are adaptive management responses that must be dealt with promptly (e.g., situations that create unsafe conditions or unduly threaten salmon or steelhead populations or individuals). Emergency Responses that require a change to hydroelectric project facilities and/or flow operations that exceed a value of \$100,000, adjusted for inflation from the date of this agreement, must be approved by the AMPT; otherwise they may be approved by the AMTT. The AMPT will treat the dollar amounts listed in this paragraph as flexible guidelines, and will evaluate these numbers and revise them as necessary as part of the yearly report. Any member of

the AMPT may propose an adjustment to these spending guidelines for any action. Adaptive Management responses from any of these three categories may be required to conform to decision-making processes such as the Federal Power Act, NEPA, CEQA, or Clean Water Act protocols and any other appropriate state or federal law.

Major Responses will be proposed in the annual report and will be proposed for funding according to response prioritization protocols described below. Responses that would be appropriately funded by the WAF or AMF would be approved at a regular AMPT meeting and the USFWS would then request disbursement of the money from USBR according to USBR protocols. Responses that would be funded by other agencies will be described in a proposal formatted per Contemporary guidelines of the targeted funding agency and will include, as a minimum, justification and alternatives, expected benefit, and the priority of species to be affected by the proposal. These response proposals would be submitted after their approval by the AMPT in late March, at the earliest opportunity for funding by target funding agencies.

Minor Responses will be considered and may be approved at the next regularly scheduled or ad hoc meeting of the AMTT or AMPT. Emergency Responses may be considered and approved at ad hoc meetings of the AMTT and/or AMPT, depending on the magnitude of the change required, as specified above.

V.C.5. Prioritizing Response Proposals

All adaptive responses proposed by the AMTT will be prioritized by the AMPT according to adaptive management objectives specified in this document (Table 4) and Contemporary objectives developed through the adaptive management process, fisheries management strategies, effectiveness, and species and ecologically based action priorities. Balancing adaptive management objectives, fisheries management strategies, effectiveness, and action priorities may be very complicated and will not likely be a mere mechanical exercise that could be captured in a flow diagram.

Several criteria will be considered in prioritizing adaptive management responses. These criteria are not necessarily ranked, because conflicts between criteria may need to be balanced or integrated.

- Responses that promote conservation strategies, such as those promoted by federal and state endangered species laws, will take precedence over those proposals that only promote production strategies such as those embodied in the CVPIA's goal to double natural production of anadromous fish.
- The Contemporary status of salmon or steelhead populations according to federal or state endangered species laws will help determine prioritization of proposals. For example, responses benefiting species listed as endangered will take precedence over those affecting threatened, candidate, or unlisted species.
- Contemporary federal endangered species designations will take precedence over Contemporary state designations.

Draft Adaptive Management Plan

- Alternative response proposals that balance the needs of more than one species will take priority over response proposals focused on individual species even if otherwise equally ranked.
- Biological effectiveness will be considered when ranking response proposals. Those proposals having the maximum long-term benefit will outweigh those having only short-term benefits.
- Cost-effectiveness will be considered when ranking response proposals.
- The effect of actions on the local community and on the maintenance of renewable energy production will be considered in prioritizing adaptive management responses.
- Species and ecological action priorities will be used to rank responses. Responses that promote the recovery of an entire population will take precedence over those that only ensure year-class success. Responses providing either of these types of benefits would outweigh those providing only protection of individuals. Finally, response proposals benefiting adult salmon or steelhead would outweigh those benefiting only juveniles.
- Although adaptive responses are generally designed to benefit salmon and steelhead populations, environmental/ecological consequences will be considered as well; the function of ecosystem processes should not be compromised to benefit only a single species.
- Responses must be technically and administratively feasible.

V.C.6. Budget Review

At the yearly scheduled AMPT meeting, budget reports will be received from cooperating funding sources including TNC and any agencies contributing to adaptive management funding. These budget reports will be used to identify fundable adaptive management tasks.

V.D. Monitoring and Data Assessment

Extensive data sets will be collected and diverse analyses will be performed in the course of implementing monitoring and data assessment under this AMP. Contemporary scientific standards, guidelines, and protocols will be followed for all study design, data collection, and analysis. Furthermore, monitoring and data assessment methodologies will be standardized to the maximum extent possible with Central Valley-wide monitoring and research efforts including CAMP, CMARP, and EPA protocols.

During the course of AMP implementation, circumstances may arise that suggest changes to existing monitoring and data assessment approaches. These may include the need to refine existing approaches, budget shortfalls, emergencies, or the identification of unanticipated monitoring needs.

Refinements of existing approaches may be proposed by the AMTT if the AMTT identifies problems with existing approaches. If the proposed refinement to a monitoring and/or data assessment approach requires no additional funding and has no programmatic consequences, then the proposed refinement may be implemented upon a Consensus decision by the AMTT. If a proposed refinement has either funding or programmatic consequences, or was proposed in response to changes in overall management approach, then the AMPT would be required to approve the proposal by Consensus before the proposed change is implemented.

Two other circumstances may arise that would require a special proposal by the AMTT to the AMPT. If any budget shortfalls are encountered in the course of implementing adaptive management monitoring and/or data assessments, the AMTT would prepare, in a timely fashion, a special proposal to the AMPT. The AMPT would then meet to discuss, and possibly approve, either changes in funding or changes to the monitoring and data assessment approach, at either the AMPT's annual meeting or an ad hoc meeting.

Similarly, if an emergency arises that suggests urgent changes to monitoring and/or data assessment approaches, or require changes to AMP flow and/or facilities elements, the AMTT will convene an emergency meeting, diagnose the problem, and submit a special proposal to the AMPT. The AMPT would then consider convening an emergency meeting where it would discuss, and possibly approve, either changes in funding or changes to the monitoring and data assessment approach.

The AMP does not propose specific diagnostic studies, but adaptive management objectives included in the AMP do recognize the potential need for diagnostic studies to pinpoint possible shortcomings in proposed restoration actions and to assist adaptive management. Potential diagnostic studies identified in the AMP include diagnoses of potential fish barriers, possible problems at fish ladders, assessment of ramping effects on anadromous salmonids at the 0.1 foot/hour Ramping Rate, water temperature modeling, and instream flow modeling. It is possible that other diagnostic studies may be required during the term of this plan. If the AMTT determines that any diagnostic study is needed to refine an adaptive management approach or to determine the appropriate response to a trigger event, the AMTT will prepare a proposal for the consideration of the AMPT. No work will be initiated on diagnostic studies without the approval and direction of the AMPT.

V.E. Funds Management

All decisions about funds management will be made by the AMPT at regularly scheduled meetings formally announced to the BCWC, CALFED, any person requesting such notification, and the public following the protocols listed herein. All Parties of the AMPT will jointly and aggressively pursue additional sources of funds at times when funding needs can be predetermined. The AMPT will work to conserve the CALFED Monitoring Fund to be used primarily as an emergency funding mechanism. Disbursement of money from this fund will be allocated evenly over the term of the

Draft Adaptive Management Plan

AMP, with a budget of approximately \$50,000 available per year to meet emergency needs. The balance of the fund is intended to provide a prudent reserve for unanticipated monitoring/emergencies.

V.F. Dispute Resolution

The MOU provides for a dispute resolution procedure that applies in the event any one of the Parties believes there is an issue regarding the interpretation of, or compliance with, any provision of the MOU including this AMP (other than an issue involving determining protocols for funding prescribed instream flow release increases utilizing the WAF or the AMF¹⁰⁰), or to resolve failure to reach consensus. Disputes involving protocols for funding prescribed instream flow release increases utilizing the WAF or the AMF¹⁰¹ will be addressed later in this section. The following dispute resolution process conducted to resolve a dispute about one or more adaptive management elements¹⁰² is in no way intended to alter or terminate the obligations of the Parties to carry out any other adaptive management element identified within this AMP which is not specifically in dispute. The disputing Parties agree to devote such time, resources, and attention to the Adaptive Management process as needed to attempt to resolve the dispute at the earliest time possible.

V.F.1. Disputing Party—Licensee

In the event that such an issue arises, where the Licensee is the disputing Party, the Licensee shall provide written notice of that issue to each of the other Parties. The Parties will then meet within 30 days of the written notice in an effort to resolve the issue. If resolution is not achieved within 14 days of the meeting, Licensee and the Resource Agencies (collectively) will each choose a person, and together, those two persons will choose a single third party who will act as mediator. Choosing a mediator is the sole role of both individuals. The Licensee and Resource Agencies will bear the cost, respectively, of the person they chose to select the mediator. Licensee and the Resource Agencies shall make their respective choice within 14 days from the date of any determination that resolution has not been achieved, and the third-party mediator shall be chosen no later than 45 days from such date of determination that resolution has not been achieved. The third-party mediator shall mediate the dispute during the next 60 days after their selection. The cost of the mediator shall be born equally by the Licensee and Resource Agencies. Any of these times may be extended or shortened by mutual agreement of the Licensee and Resource Agencies or as necessary to conform to the procedure of an agency or other entity with jurisdiction over the dispute. If resolution through non-binding mediation is still not achieved, the Resource Agencies and Licensee shall petition FERC to resolve the subject dispute for those actions within FERC's jurisdiction. Any such petition shall include the administrative record of the mediation process. Resource Agencies and Licensee will be responsible for assuming their respective costs for any

¹⁰⁰ MOU 14.0

¹⁰¹ MOU 14.0

¹⁰² Adaptive management elements include but are not limited to objectives, monitoring and data assessment approaches, trigger events, responses, end points, or roles and responsibilities.

such FERC process. For those issues falling outside the scope of FERC's jurisdiction, where any one of the Parties fails to achieve resolution through the dispute resolution process described above, then any one of the Parties may seek any available appropriate administrative and/or judicial remedies.¹⁰³

V.F.2. Disputing Party—Resource Agency

In the event that such an issue arises in which one of the Resource Agencies is the disputing Party, the disputing Resource Agency shall provide written notice of that issue to each of the other Parties. The Parties will then meet within 30 days of the written notice in an effort to resolve the issue. If resolution is not achieved within 14 days of the meeting, the disputing Resource Agency and the other Parties (collectively) will each choose a person, and together, those two persons will choose a single third party who will act as mediator. Choosing a mediator is the sole role of both individuals. The disputing Resource Agency and other Parties will bear the cost, respectively, of the person they chose to select the mediator. The disputing Resource Agency and other Parties shall make their respective choice within 14 days from the date of any determination that resolution has not been achieved, and the third-party mediator shall be chosen no later than 45 days from such date of determination that resolution has not been achieved. The third-party mediator shall mediate the dispute during the next 60 days after their selection. The cost of the mediator shall be born equally by the disputing Resource Agency and other Parties. Any of these times may be extended or shortened by mutual agreement of the disputing Resource Agency and other Parties or as necessary to conform to the procedure of an agency or other entity with jurisdiction over the dispute. If resolution through non-binding mediation is still not achieved, the disputing Resource Agency and other Parties shall petition FERC to resolve the subject dispute for those actions within FERC's jurisdiction. Any such petition shall include the administrative record of the mediation process. The disputing Resource Agency and other Parties will be responsible for assuming their respective costs for any such FERC process. For those issues falling outside the scope of FERC's jurisdiction, where any one of the Parties fails to achieve resolution through the dispute resolution process described above, then any one of the Parties may seek any available appropriate administrative and/or judicial remedies.¹⁰⁴

V.F.3. Water Acquisition Fund

If Consensus regarding flow changes is not achieved by the AMTT or AMPT, Licensee and the Resource Agencies (collectively), each will choose a person, and together those two persons will choose a single third party who will act as mediator. Each Party shall make its choice within 14 days from the date of any determination that Consensus has not been achieved, and the third-party mediator shall be chosen by those Parties no later than 45 days from such date of determination that Consensus has not been achieved. These times may be extended by mutual agreement of the Resources Agencies

¹⁰³ MOU 14.0

¹⁰⁴ MOU 14.0

Draft Adaptive Management Plan

and Licensee. If Consensus through mediation is still not achieved, the Resource Agencies and Licensee reserve their right to petition FERC to resolve the subject action. Resource Agencies and Licensee will be responsible for assuming their respective costs for any FERC process.

However, in the interim, instream flow releases determined to be necessary by the Resource Agencies through the aforementioned protocols will be provided by Licensee until there is either Consensus or FERC approval of the additional instream flow releases. WAF moneys shall be used to implement consensually agreed-to or FERC-approved actions and interim actions that have been taken pending FERC action.¹⁰⁵

V.F.4. Adaptive Management Fund

For disputes arising regarding the funding of prescribed instream flow increases, the protocols will be the same as for the WAF described above. For disputes arising regarding funding facility modifications, the protocols will be the same as for the WAF described above, with two exceptions: (1) no interim action will be implemented prior to any required FERC approval of a license amendment or other necessary action by FERC; and (2) for all actions resolved by FERC, in which Licensee is in the minority opinion (opposing a proposed action expenditure), the AMF will contribute 60 percent of any resulting facility modification cost; in the case of Licensee being in the majority opinion (in support of a proposed action expenditure), the AMF will contribute 100 percent of any resulting facility modification cost.

¹⁰⁵ MOU 9.2.A.3

VI. APPENDIX LISTING AMP MONITORING ACTIVITIES

Appendix Table 1. Adaptive Management monitoring field studies and analysis.

Adaptive Management Monitoring Tasks	Task Type	Objective	Responsibility	Timeline	Estimated Annual Cost
Estimate adult and jack population sizes using Coleman barrier weir.	field study	POP-1, POP-2, POP-3, POP-4	Resource Agencies	13 – 16 years minimum	A \$50,000
– Compare 3 year-running average CRR with expected CRR when populations allow	analysis	POP-2, POP-3, POP-4	Resource Agencies	13 – 16 years minimum	included in A
– Evaluate CRR trends in light of limiting factors in the Sacramento River system	analysis	POP-2, POP-3	Resource Agencies	13 – 16 years minimum	included in A
– Compare CRR to Reference Watersheds	analysis	POP-2, POP-3	Resource Agencies	13 – 16 years minimum	included in A
– Compare CRR 10-year trend to CRR value of 1.0	analysis	POP-4	Resource Agencies	Term of AMP	included in A
Count adult and jack anadromous salmonids using video and electronic methods at ladders	field study	PASS-1	Licensee ¹⁰⁶	3 years or longer per AMP protocols	proprietary information
Estimate adult and jack anadromous salmonid sub-population sizes and distribution by reach using counting facilities at new fish ladders, after PASS-1 is done.	field study	POP-1	Resource Agencies ¹⁰⁶	After Licensee’s responsibility ends until no longer needed	\$30,000
Estimate juvenile production when adult populations are large enough to produce detectable numbers of outmigrants	field study	POP-1, POP-2, POP-3, POP-4	Resource Agencies	Term of AMP	B \$250,000
– Compare juvenile production to expected production from previous spawners and ecological factors	analysis	POP-1	Resource Agencies	Term of AMP	included in B
– Compare juvenile production to production observed in Reference Watersheds	analysis	POP-1	Resource Agencies	Term of AMP	included in B
Estimate pre-project juvenile production	field study	POP-1	Resource Agencies	1998-2002	\$250,000

¹⁰⁶ Pursuant to the MOU as explained in Passage Objective 1 and the Facilities Monitoring Plan, the Licensee is expected to operate video and electronic counting equipment to count adult and jack anadromous salmonids for the first three years, or longer per AMP protocols, after the transfer of facilities from USBR to PG&E. The Resource Agencies will take over these fish counting responsibilities to satisfy Population Objective 1 at the end of the Licensee’s obligation.

Draft Adaptive Management Plan

Adaptive Management Monitoring Tasks	Task Type	Objective	Responsibility	Timeline	Estimated Annual Cost
Estimate juvenile production at the terminus of each fork when adult populations are large enough to produce detectable numbers of outmigrants	field study	POP-1	Resource Agencies	5 years, 2002-2007	\$100,000
Estimate adult and jack distribution using carcass counts, snorkel surveys, and /or redd surveys	field study	POP-1, POP-2, POP-3, POP-4, PASS-1, PASS-3	Resource Agencies	Term of AMP	C \$155,000
- Evaluate physical and biological habitat conditions for each reach	field study	POP-1	Resource Agencies	Term of AMP	included in C
- Observe and record habitat use, and compare observed habitat use to expected habitat use	field study	HAB-1	Resource Agencies	Term of AMP	included in C
- Gauge salmon or steelhead response to tailrace leaks or discharge of water	field study	HAB-3	Resource Agencies	Term of AMP	included in C
- Monitor Ramping Rates and threshold flow levels for effects on stranding or isolating	field study	HAB-4	Resource Agencies	During scheduled outages 2002-2007	included in C
- Monitor fish stranding	field study	HAB-4	Resource Agencies	Term of AMP	included in C
- Monitor natural flow fluctuations for affects on stranding and isolating	field study	HAB-4	Resource Agencies	Conducted in 2000-2007	included in C
- Compare stranding and isolating effects of natural flow fluctuations and project induced ramping	analysis	HAB-4	Resource Agencies	Completed 2007	included in C
- Inspect potential barriers during annual surveys	field study	PASS-3	Resource Agencies	Term of AMP	included in C
- Compare spawner distribution relative to suspected barriers	analysis	PASS-3	Resource Agencies	Term of AMP	included in C
- Compare ladder counts with spawning distribution and predicted habitat use.	analysis	PASS-1, POP-1	Resource Agencies	Term of AMP	Included in C
- Compare observed spawner distribution relative to expected spawner distribution for a particular species	analysis	PASS-3	Resource Agencies	Term of AMP	included in C
- Document fish injury caused by fish ladders	field study	PASS-1	Resource Agencies	Term of AMP	included in C
- Observe adult congregations below dam and compare to ladder counts	field study	PASS-1	Resource Agencies	Term of AMP	included in C

Draft Adaptive Management Plan

Adaptive Management Monitoring Tasks	Task Type	Objective	Responsibility	Timeline	Estimated Annual Cost
Use Contemporary methodologies that consider flow regime to identify actual barriers	field study	PASS-3	Resource Agencies	contingent on need	contingent on need
Diagnose threshold flow on the North Fork at which Ramping Rates differ from 0.1 foot/hour	field study	HAB-4	Resource Agencies	During scheduled outages 2001-2003	\$10,000
Monitor longitudinal water temperature regime	field study	HAB-2, POP-1	Resource Agencies	5 years minimum	\$20,000
Monitor cold water from Bluff Springs	field study	HAB-2	Resource Agencies	Term of AMP	none
Monitor water temperature at target points within stream	field study	HAB-2, POP-1	Resource Agencies	Term of AMP	\$5,000
Monitor climatic conditions	field study	HAB-2, POP-1	Resource Agencies	5 years minimum	\$13,000 first year and \$3,000 thereafter
Monitor leaks and discharge for indications that it alters the South Fork thermal or chemical regime	field study	HAB-3	Licensee	Term of AMP	proprietary information
Compare leakage or discharge to stream flow rates	analysis	HAB-3	Licensee	Term of AMP	proprietary information
Monitor hydraulic parameters at fish ladders for Fail-Safe capabilities	field study	PASS-1	Licensee	Term of AMP	proprietary information
Measure and compare hydraulic parameters at fish screens for calculated and measured diversion rates	field study	PASS-2	Licensee	Measure as relevant throughout the OMP	proprietary information
Monitor key hydraulic parameters at fish screens for Fail-Safe capabilities	field study	PASS-2	Licensee	Continuously throughout AMP	proprietary information
Observe canals for entrainment during other activities and when dewatered	field study	PASS-2	Licensee	Continuously throughout AMP	proprietary information

Draft Adaptive Management Plan

**Appendix Table 2. Possible adaptive management diagnostic analysis and field studies
(the need for these will be determined through AMP monitoring and protocols)**

Possible Adaptive Management Diagnostic Studies	Task Type	Objective	Responsibility	Timeline	Estimated Annual Cost
Water temperature modeling	diagnostic analysis	HAB-2	Resource Agencies	5 years	unknown
Apply advancements in flow/habitat relationships	diagnostic analysis	HAB-1	Resource Agencies, Licensee	To be determined	unknown
Study fish passage at ladders with tagged test fish	diagnostic field study	PASS-1	Resource Agencies	Term of AMP	unknown
Monitor fallback with tagged test fish	diagnostic field study	PASS-1	Resource Agencies	Term of AMP	unknown
Conduct a diagnostic study of ramping thresholds in the North Fork to determine the flow level above which ramping rates may differ from 0.1 foot/hour.	diagnostic field study	HAB-4	Resource Agencies	Term of AMP	unknown

VII. APPENDIX OF PROPOSED FERC LICENSE ARTICLES AFFECTED BY ADAPTIVE MANAGEMENT

This appendix will list the text of proposed FERC license articles that pertain to FERC Project No. 1121 facilities or operations that will be affected by provisions in the AMP. Contents of this appendix will be prepared in time to be included in the Draft EIR/EIS and draft license amendment.

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