Chapter 2
Project Description

The following sections describe the proposed action for the Restoration Project and include a description of the geographic scope, purpose and need, project objectives, and environmental commitments. The EIS/EIR for the Restoration Project (Jones & Stokes 2003a) identifies the proposed action as the "Five Dam Removal Alternative." The Five Dam Removal Alternative will be referred to in this ASIP as the "Restoration Project." A detailed description of the proposed activities at each project site for the Restoration Project follows the list of environmental commitments. Following the detailed project description are an explanation of interrelated and interdependent actions and a description of the Restoration Project's contribution to MSCS goals.

Geographic Scope

The Restoration Project lies within the Battle Creek watershed, which is situated on the volcanic slopes of Mt. Lassen in southeastern Shasta and northeastern Tehama Counties. The Restoration Project area is located in southern Shasta and northern Tehama Counties on lands south of Shingletown and State Route (SR) 44, and north of Paynes Creek and SR 36 (Figure 1-1). The Restoration Project consists of the portion of the Hydroelectric Project below the natural fish barriers (Figure 1-2). The upper project limit on North Fork Battle Creek is the absolute natural fish barrier above North Battle Creek Feeder Diversion Dam, 14 miles upstream of the confluence with South Fork Battle Creek. The upper project limit on South Fork Battle Creek is the natural fish barrier named Angel Falls, located approximately 6 miles above South Diversion Dam. The lower project limit is the confluence of the Coleman Powerhouse tailrace channel and the mainstem of Battle Creek. The location of each Restoration Project site is shown on Figure 2-1.

Purpose and Need

Within the past century, anadromous salmonid fish species in the Sacramento River system have declined because of a number of factors, including the loss and degradation of spawning habitat as a result of changes in hydrologic regimes caused by water management for flood control, irrigation, and hydropower production. In order to preserve and enhance current salmonid populations

within the Sacramento River system, habitat restoration efforts are needed. An opportunity to restore uniquely valuable habitat exists in Battle Creek, a tributary to the Sacramento River.

The purpose of the Restoration Project is to restore approximately 42 miles of habitat in Battle Creek and an additional 6 miles of habitat in its tributaries while minimizing the loss of clean and renewable energy produced by the Hydroelectric Project.

The Restoration Project will be accomplished through the modification of Hydroelectric Project facilities and operations, including instream flow releases. Habitat restoration would enable safe passage for naturally produced salmonids and would facilitate their growth and recovery in the Sacramento River and its tributaries. These salmonids include Central Valley spring-run Chinook salmon, state- and federally listed as threatened; Sacramento River winter-run Chinook salmon, state- and federally listed as endangered; and Central Valley steelhead, federally listed as threatened.

The timely restoration of a drought-resistant, spring-fed system like Battle Creek is especially important to species such as winter-run and spring-run Chinook salmon and steelhead, which are dependent on cool-water stream habitats. Winter-run Chinook salmon is actually obligated to habitats like Battle Creek that have reaches kept constantly cool year-round by springs. Historically, winter-run Chinook salmon populations occurred in the creek, but at present, the only significant population of winter-run Chinook salmon occurs in the mainstem of the Sacramento River below Shasta Dam (Yoshiyama et. al. 1998). This section is kept cool by releases from the reservoir. However, periods of extended drought could exhaust its coldwater reserve, leaving the fish susceptible to reproductive failure. Because it is inevitable that serious drought conditions will again affect Shasta Lake, it is necessary to have drought resistant refugia available in the upper Sacramento River system for populations sensitive to drought conditions like winter-run and spring-run Chinook salmon.

The Restoration Project facilitates a timely restoration of the stream compared with waiting until 2026 for the expiration of the existing FERC license of the Battle Creek Hydroelectric Project. One of the most valuable aspects of hydropower is that it is renewable through annual snowmelt and rainfall. Hydropower's fuel, water, is replenished with precipitation. Unlike fossil fuel technologies, hydropower's fuel is reused because it is not consumed in the production of electricity. Hydropower produces no greenhouse gases or other air pollutants. The use of hydropower makes it possible to avoid the additional burning of natural gas or other fossil fuels, which in turn avoids the release of the air emissions carbon dioxide, nitrogen oxide, and carbon monoxide and the production of ozone or smog.

Project Objectives

Specific project objectives were developed to expand on the purposes of the Restoration Project and to help develop project alternatives, which are described and analyzed in the EIS/EIR for the Restoration Project. This ASIP analyzes project-related effects of the proposed action (Five Dam Removal Alternative). The project objectives are consistent with recovery plans for listed anadromous fish species. The Restoration Project is consistent with the following specific objectives:

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

The Restoration Project is a proactive, cooperative undertaking among the public, interested parties, the BCWG, BCWC, state and federal agencies, and PG&E to help restore the anadromous fishery in the Sacramento River watershed, where funding and restoration potential are uniquely promising.

[1] The MOU defines failsafe as a level of performance and reliability. Those standards are specified in Sections 2.10 and 2.11 of the MOU (Appendix A).

Environmental Commitments

The following environmental commitments will be implemented before and/or during any Restoration Project construction activities, where applicable. These measures are consistent with broader measures adopted in the CALFED ROD) (CALFED Bay-Delta Program 2000b).

Develop and Implement a Worker Environmental Education Program

Construction contractor and subcontractor personnel will be required to participate in and comply with an environmental education program provided by Reclamation. This program will include, but is not limited to (1) awareness regarding federal, state, and local environmental laws and regulations and permits, as well as the penalties for noncompliance with environmental requirements and conditions; (2) threatened and endangered species and special-status species, as well as their habitats; (3) cultural resource sites; and (4) environmental protection measures, mitigation, compensation, and restoration. A member of the contractor's management staff shall participate in the training sessions to discuss the contractor's environmental protection plans. Upon completion of each training session, each employee will be required to sign a statement indicating that he/she has received the training.

Obtain and Implement the Conditions of the Environmental Permits

Reclamation will obtain the required state and federal permits for the Restoration Project and comply with all conditions included in those permits. Where appropriate, the permit conditions will be incorporated into the project engineering plans and specifications. These permits will include, but may not be limited to, the following:

- Endangered Species Act, Section 7, Incidental Take Authorization
- Clean Water Act, Section 404 Letter of Permission
- Clean Water Act, Section 401 Water Quality Certification
- California Department of Fish and Game Streambed Alteration Agreement

Designate Work and Exclusion Zones

Reclamation and/or the construction contractor will ensure that construction equipment and associated activities will be confined to the designated work zone

in areas that support sensitive resources. Construction equipment will be confined to a designated work zone (including access roads) at each project site. Prior to construction, the work zone will be clearly staked and flagged.

Exclusion zones will be delineated in the field by a qualified biologist using global positioning system (GPS) units to measure distances from sensitive resources. These zones will be demarcated by orange construction fencing or along access roads with stakes and ropes. All fences will have signs attached that identify each area as an *Environmentally Sensitive Area*. The fencing will be installed before construction activities begin and will be maintained throughout the construction period. The following paragraph will be included in the construction specifications for environmentally sensitive areas:

> The Contractor's attention is directed to the areas designated as "Environmentally Sensitive Areas." These areas are protected, and no entry by the Contractor for any purpose will be allowed unless specifically authorized in writing by the Bureau of Reclamation. The Contractor shall take measures to ensure that Contractor's employees do not enter or disturb these areas, including giving written notice to employees and subcontractors.

During the environmental education program, construction personnel will be informed about the importance of avoiding ground-disturbing activities outside the designated work zone. During construction, the construction monitors and resource monitors will ensure that construction equipment and associated activities avoid any disturbance of sensitive resources outside the designated work zones. Construction personnel will avoid all marked environmentally sensitive locations and cultural resources locations within and outside of the contractor use area limits. Construction personnel will also avoid the root zone of individual oak woodland trees, which will be marked by flagging off the dripline of each tree. Environmental monitors will conduct surveys as appropriate for threatened and endangered species and special-status species. The following measures will also be employed:

- Use and storage of construction equipment, including helicopters, will be confined to within the designated contractor use area limits.
- Existing roads and access points will be used to the extent possible to minimize disturbance to wildlife and their habitats.
- Excavating, filling, and other earthmoving within the contractor use areas will be done gradually to allow wildlife to escape in advance of machinery and moving soils.
- Riparian vegetation or wetlands temporarily affected by loss or reduction of water supplies as a result of construction activities will be provided with replacement water supplies.
- Staging areas, borrow material sites, parking locations, stockpile areas, and storage areas will be located outside of environmentally sensitive locations and will be clearly marked and monitored.

Anadromous Fish Spawning Exclusion

A qualified fish biologist, designated by Reclamation in consultation with NOAA Fisheries and DFG, will identify spawning gravel in the stream channel area that has the potential to be directly disturbed by construction and dam removal activities at Wildcat, Eagle Canyon, and Coleman Diversion Dams (i.e., downstream of the existing blocked fish ladders on Coleman and Eagle Canyon Diversion Dam). The spawning gravel will be armored with temporary mats or other armoring devices that will prevent spawning by Chinook salmon and steelhead. The gravels will be armored at least 2 months before construction and demolition activities that could kill or injure eggs and larvae of steelhead and Chinook salmon in the gravel. The armoring materials will be installed in areas where heavy equipment may be operated within the stream channel or in the vicinity of potential blasting. The need for temporary armoring to exclude spawning at construction locations will be determined by a qualified fish biologist prior to any construction activity. The temporary mats or other armoring devices will be removed after instream construction and blasting have been completed.

Implement a Fish Rescue Operation

Stream channel segments may be isolated from the streamflow during construction. Reclamation, in consultation with NOAA Fisheries and DFG, will ensure that a fish biologist is on site to implement a fish rescue operation in isolated pools that may harbor stranded fish. Fish will be removed from isolated pools by seining or electroshocking. Reclamation, in consultation with NOAA Fisheries and DFG, will also ensure that the electroshocking or seining team includes at least one person with a 4-year college degree in fisheries or biology, or a related degree. The person must also have at least 2 years of professional experience in fisheries field surveys and the use of electroshocking equipment. Fish collection assumes a 2- to 4-person team per electroshocker or seine to facilitate safe and efficient collection and transport. Up to two electroshocking or seining teams may be used to facilitate efficient fish removal, particularly in reaches where the average width of the channel is greater than 20 feet or where an abundance of instream cover makes fish capture difficult. The electroshocking team will complete a minimum of three passes through each isolated pool. The number of electroshocking passes may exceed three if necessary to achieve removal of most fish. Captured fish will be placed in 5-gallon buckets. At the end of each pass, captured fish will be transferred into buckets with aerated water or into in-river holding tanks (e.g., buckets with small holes or other similar containers). Water temperature in holding buckets will be monitored and river water will be added or replaced as needed to maintain fish in good condition.

Fish will be counted and recorded by species. All fish will be released in the live channel upstream of the construction area unless it is determined these fish are downstream migrants that should be released downstream of the affected areas.

The number of Chinook salmon and steelhead captured and the number of Chinook salmon and steelhead accidentally killed prior to release will be reported by email to NOAA Fisheries within 5 working days. All dead Chinook salmon and steelhead will be frozen and retained until NOAA Fisheries provides direction for disposition or until 6 months following fish capture.

Debris Removal

Construction activities will occur at North Battle Creek Feeder, Eagle Canyon, Wildcat, Coleman, Lower Ripley Creek Feeder, Inskip, Soap Creek Feeder, and South Diversion Dams. Dam removal will occur at Wildcat, Coleman, South, Lower Ripley Creek Feeder, and Soap Creek Feeder Diversion Dams. Debris in the stream channel resulting from construction and dam removal activities will be removed by Reclamation and/or the construction contractor and deposited off site. Debris will be removed to the extent that it will not affect conditions supporting upstream migration of juvenile and adult steelhead and Chinook salmon at minimum flow releases from upstream dams and will not adversely modify spawning (e.g., armoring) or rearing habitat. A qualified fish biologist will inspect the stream channel and confirm the restoration of habitat conditions.

Implement Environmental Timeframes

Reclamation and/or the construction contractor will complete all activities in a timely manner to minimize the duration and impacts resulting from construction. In addition, all activities will occur during the times of the year that are least detrimental to the environment. Instream work will be conducted during periods of low streamflow (May–October). In addition, construction activities that could adversely affect nesting birds and their habitat will be limited to the nonbreeding period, and construction activities that could adversely affect bat colonies and their habitat will be limited to the nonhibernation, nonmaternity colony period (August–October).

Develop an Implementation Plan

As part of the environmental protection strategy, Reclamation will develop a mitigation, compensation, restoration, and reporting plan, referred to in this document as an implementation plan. The document will be developed through coordination with the state and federal agencies responsible for the Restoration Project. This plan will provide detailed information on how each mitigation measure will be implemented and monitored during the preconstruction, construction, and postconstruction periods. The implementation plan will contain the following documents to be implemented during the construction phase:

- storm water pollution prevention plan (SWPPP) (including specific erosion control and site reclamation measures),
- spill prevention and countermeasure plan,
- habitat compensation plan,
- wetland and riparian mitigation and monitoring plan,
- Migratory Bird Treaty Act (MBTA) compliance program, and
- environmental compliance monitoring program.

General information describing each plan is provided in the following sections.

Storm Water Pollution Prevention Plan

Reclamation and/or the construction contractor will prepare and implement a SWPPP as part of the National Pollutant Discharge Elimination System (NPDES) General Construction Activity Storm Water Permit. The SWPPP will include measures to minimize erosion and sediment transport to Battle Creek. It will include:

- best management practices (BMPs) (e.g., sediment containment devices, protection of construction spoils, proper installation of cofferdams);
- site restoration;
- postconstruction monitoring of the effectiveness of BMPs;
- contingency measures;
- details about contractor responsibilities;
- a list of responsible parties; and
- a list of agency contacts.

Measures in the plan will include, at a minimum:

- avoiding work or equipment operation in flowing water during in-channel activities by constructing cofferdams and diverting all flows around construction sites;
- conducting all construction work according to site-specific construction plans that minimize the potential for sediment input to the aquatic system, including constructing silt barriers immediately downstream of the construction site and minimizing disruption of the streambed at and adjacent to the construction site;
- using sedimentation fences, hay bales certified as weed-free, sandbags, water bars, and baffles as additional sources of protection for waters, ditches, and wetlands;

- identifying all areas requiring clearing, grading, revegetation, and recontouring and minimizing the areas to be cleared, graded, and recontoured;
- storing construction spoils out of the stream (above the ordinary high-water mark) and protecting receiving waters from these erosion source areas with sedimentation fences or other effective sediment control devices;
- grading spoil sites to minimize surface erosion; and
- covering bare areas with mulch and revegetating all cleared areas with appropriate native, noninvasive species.

These measures will be incorporated into the project design as conditions of a DFG Section 1600 streambed alteration agreement. Specific requirements for reducing impacts on stream habitat will be coordinated with DFG during the agreement process. An application for a waste discharge permit will be filed, and compliance with the monitoring and reporting requirements for project construction is necessary.

Spill Prevention and Countermeasure Plan

Before construction begins, Reclamation and/or the construction contractor will prepare a spill prevention and countermeasure plan (SPCP) that includes strict on-site handling rules to keep construction and maintenance materials out of drainages and the waterway. Goals of this plan will be to:

- prevent contamination of streamside soil and the watercourse from cement, concrete or concrete washing, asphalt, paint or other coating materials, oil or other petroleum products, and hazardous materials;
- clean up spills immediately and notify DFG immediately of any spill and cleanup procedures;
- prepare, prior to construction, a spill control and response plan and restrict the volume of petroleum products allowed on site to the volume that can be addressed by the control and spill response measures included in the plan;
- provide staging and storage areas outside the stream zone for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants;
- store hazardous substances in staging areas at least 100 feet from stream and other water surfaces;
- perform refueling and vehicle maintenance at least 100 feet from receiving waters;
- minimize equipment operations in flowing water and remove vehicles from the normal high-water area before refueling and lubrication; and
- inspect equipment to ensure that seals prevent any fuel, engine oil, and other fluids from leaking.

These measures listed above, which prevent contamination, clean up spills, provide staging and storing areas, and minimize equipment operations in flowing water, will be incorporated into the project design as conditions of the DFG Section 1600 streambed alteration agreement. Specific requirements for reducing impacts on stream habitat will be coordinated with DFG during the agreement process.

Habitat Compensation Approach

Reclamation, in consultation with USFWS and DFG, will mitigate temporary habitat impacts associated with the Restoration Project on site through appropriate habitat restoration. Permanent impacts associated with the Restoration Project will be compensated for with a program view of ERP actions within the watershed. The mitigation approach for permanent impacts presented herein includes consideration of a CALFED–funded conservation easement in the Battle Creek watershed for offsetting compensation needs for riparian and upland habitats.

The MSCS guidelines and programmatic conservation measures reconcile effects of multiple ERP projects in a single watershed, in this case the Battle Creek watershed, into a balanced compensation approach. The MSCS states:

> ERP actions to restore or enhance habitats that are implemented concurrently and in proximity to one another will be considered together for purposes of assessing their impacts on species and habitats and imposing compensatory measures. If the restoration and enhancement actions culminate in an increase or improvement in a particular NCCP community, compensatory measures may not be required even if there is a temporary or limited adverse modification of the community or habitat type. Ultimately, the need for compensatory conservation measures for CALFED restoration and enhancement actions will depend on the type, location, timing, and success of the related actions (CALFED 2000c).

The Restoration Project clearly meets those criteria, as it makes extensive efforts to avoid and minimize adverse effects and mitigates the loss of habitat on site to the extent possible. Therefore, the use of a CALFED–funded conservation easement within the project area has been proposed. Following implementation of Restoration Project avoidance, minimization, and restoration measures, the remaining environmental compensation needs of the Restoration Project could be considered offset by the environmental benefits of the CALFED–funded Burton Ranch easement along the mainstem of Battle Creek. Habitat credit comes from preservation, in perpetuity, of riparian and upland habitat that is under threat of future impacts attributable to human land use/development. This conservation easement would provide the in-kind benefits needed to offset habitat values lost during implementation of the Restoration Project. For more details on the conservation easement approach, see Appendix F, “Habitat Compensation Approach for the Battle Creek Salmon and Steelhead Restoration Project: A Program View.”

Wetland and Riparian Mitigation and Monitoring Plan

Reclamation, in consultation with NOAA Fisheries, USFWS, and DFG, is preparing a wetland and riparian mitigation plan to mitigate impacts on wetlands subject to U.S. Army Corps of Engineers (Corps) jurisdiction in the Restoration Project area. The plan is intended to provide the Corps and USFWS with sufficient information to determine the adequacy of the proposed mitigation and to issue a Section 404 permit. The Corps will approve the plan prior to project construction activities that affect the Corps-jurisdictional areas in the project area.

The plan will be prepared to meet or exceed the specifications and mitigation requirements pertaining to Corps-jurisdictional areas specified in the Draft Fish and Wildlife Coordination Act (FWCA) report prepared for the Restoration Project (U.S. Fish and Wildlife Service 2003). The plan will also be provided to the SWRCB to determine the adequacy of the proposed mitigation with respect to water quality and to issue a Section 401 water quality certification for the project.

The goal of the mitigation effort is to avoid and minimize adverse effects on wetland and riparian habitat, as well as replace the acreage and function and values of wetlands and riparian habitat permanently affected by the project. To support this goal, the wetland and riparian mitigation plan will meet the following objectives:

- provide compensatory mitigation for permanent impacts in the form of habitat creation, restoration, preservation, or enhancement of wetland habitats in the Restoration Project area (i.e., Battle Creek watershed);
- to the extent practicable, provide in-kind mitigation and design the habitats so that they will have equal or better function and value and quality than the wetlands that will be affected by the project;
- immediately restore habitats that have been temporarily affected by Restoration Project construction to predisturbance conditions;
- integrate concerns for special-status species (e.g., valley elderberry longhorn beetle) into the mitigation design to the maximum degree practicable; and
- design the mitigation wetlands so that, once established, they will require no maintenance.

A performance monitoring report will be submitted by Reclamation to the Corps at the end of each monitoring year. The report will summarize monitoring methods, results, progress toward meeting the final performance standards, and corrective actions taken.

Migratory Bird Treaty Act Compliance Program

Reclamation and/or the construction contractor will implement the following mitigation measures, as applicable, for all project construction:

1. Known or potential nesting and roosting sites, such as live trees with cavities and all snags and stumps, will be protected to the extent practicable year-round.
2. Existing nests of raptors or any other bird will not be removed from their locations.
3. To the extent possible, construction activities that could adversely affect nesting birds and rearing of young through take of nests, impacts on nesting habitat, or disturbance from noise or human activity, will be limited to the period between September 1 and February 1 to avoid the bird breeding season.
4. Any habitat providing nesting cover for birds, such as grassland, mixed chaparral, live oak woodland, blue oak woodland, gray pine/oak woodland, and westside ponderosa pine, that must be removed for construction purposes, will be removed between September 1 and February 1 prior to construction, to the extent possible.
5. Construction sites will be monitored for bird nesting activity during the breeding season.
6. If raptors or any other birds appear at or near a construction site and attempt to nest, typical levels of construction noise and activity that will occur at the site during the breeding season will be sustained, such that the birds can accept or reject the site based on their assessment of the disturbance. Unless it is known that the nest site will be physically disturbed, the birds will be allowed to nest if they choose under the assumption that they will be able to tolerate construction noise and activity.
7. If disturbance of a nest with eggs or young appears unavoidable, or nesting activity, such as incubation or feeding of young, may be affected, a project contact at USFWS and DFG will be consulted before disturbance occurs.
8. If potential nesting habitat must be affected during the breeding season, a project contact at USFWS and DFG will be consulted before disturbance occurs.
9. If a project site meets buffer zone criteria for an active nest during the breeding season, disturbance probably can be assumed insignificant, but USFWS and DFG still will be contacted for known occurrences of these species on the project area.

Environmental Compliance Monitoring Program

Reclamation will develop an environmental compliance construction monitoring program to ensure that the mitigation measures and compensation measures identified in the Battle Creek EIS/EIR are implemented in an appropriate and timely manner. As part of this construction monitoring program, Reclamation will retain qualified biologists, environmental resource specialists, and archeologists to monitor construction activities near environmentally sensitive areas, including areas that support threatened, endangered, and special-status species; migratory bird nesting; woody riparian vegetation; wetlands and perennial drainage crossings; and cultural sites.

Construction monitors will be hired and trained by Reclamation prior to construction and will be responsible for daily preconstruction surveys, staking resources, on-site monitoring, clearing equipment and vehicle staging areas, documentation of violations and compliance, coordination with construction inspectors, and postconstruction documentation. Resource monitors will be responsible for patrolling work zones and working with construction inspectors to ensure that barrier fencing, stakes, and required setback buffers are maintained.

The roles and responsibilities of the resource monitors and other individuals on the project, compliance documentation, and other elements of the environmental compliance monitoring program will be clearly outlined in the Implementation Plan.

Detailed Description of Restoration Project Elements

The Restoration Project modifies both Hydroelectric Project facilities and operations to provide water management in Battle Creek consistent with the descriptions in the MOU (Appendix A). Hydroelectric Project facilities that would be modified under the Restoration Project include North Battle Creek Feeder, Eagle Canyon, Wildcat, Coleman, Lower Ripley Creek Feeder, Inskip, Soap Creek Feeder, South, and Asbury Diversion Dams; the Eagle Canyon, Wildcat, Inskip, and South Canals; and the Inskip and South Powerhouses. Table 2-1 summarizes the individual components of the Restoration Project.

Table 2-1. Restoration Project Components

Site Name	Component
North Battle Creek Feeder Diversion Dam	55-cfs fish screen*
	Fish ladder*
	Minimum instream flow set for North Battle Creek Feeder reach
Eagle Canyon Diversion Dam	70-cfs fish screen*
	Fish ladder*
	Removal of a segment of the Eagle Canyon Spring Collection Facility
	Minimum instream flow set for Eagle Canyon reach
Wildcat Diversion Dam	Dam and appurtenant facilities removed
South Diversion Dam	Dam and appurtenant facilities removed
Soap Creek Feeder Diversion Dam	Dam and appurtenant facilities removed
Inskip Diversion Dam and South Powerhouse	220-cfs fish screen*
	Fish ladder*
	Construction of South Powerhouse and Inskip Canal connector (tunnel)
	Minimum instream flow set for Inskip reach
Lower Ripley Creek Feeder Diversion Dam	Dam and appurtenant facilities removed
Coleman Diversion Dam and Inskip Powerhouse	Dam removed
	Construction of Inskip Powerhouse and Coleman Canal connector
	Inskip Powerhouse bypass replaced
Asbury Diversion Dam	Reoperate
	Stream gaging station installed
	Minimum instream flow set for Baldwin Creek

* Reliability and performance standards for fish screens and fish ladders are specified in MOU Sections 2.10 and 2.11 (Appendix A).

Figure 2-2 presents a schematic of the facilities and the flows that would occur under the Restoration Project. The inset table in Figure 2-2 indicates the continuous minimum instream flow releases that would increase below North Battle Creek Feeder, Eagle, Inskip, and Asbury Diversion Dams after completion of facility modifications.

The instream flows are an integral component of the Restoration Project. The BCWG Biological Technical Team collaboratively developed a detailed

minimum flow release schedule for each dam. The Biological Technical Team included biologists from government fishery agencies and PG&E, and participants from the BCWG. The proposed flow schedule prioritized species by stream reach and considered flows providing passage and water temperature. One outside review was completed as a comparison to recently applied methodology at another Central Valley salmon stream. During the development of the Battle Creek Salmon and Steelhead Restoration Project MOU, the flow schedule developed by the Biological Team was reviewed and accepted along with an adaptive management plan that would address future uncertainties.

The Restoration Project provides the following modifications to the Hydroelectric Project that would achieve the restoration of ecological processes important to anadromous fish.

- Adjustments to Hydroelectric Project operations, including allowing cold spring water to reach natural stream channels, decreasing the amount of water diverted from streams, and decreasing the rate and manner in which water is withdrawn from the stream and returned to the canals and powerhouses following outages.
- Modification of facilities, such as fish ladders, fish screens and bypass facilities, diversion dams, and canals and powerhouse discharge facilities.
- Changes in the approach used to manage the Hydroelectric Project to balance hydroelectric energy production with habitat needs, using ecosystem-based management that protects and enhances fish and wildlife resources and other environmental values using adaptive management, reliable facilities, and water rights transfers, among other strategies.

The Restoration Project intends to restore the ecological processes that would allow the recovery of steelhead and Chinook salmon populations in Battle Creek and minimize the loss of clean and renewable electricity through modifications to the Hydroelectric Project. The ecological processes in Battle Creek that have been affected to varying degrees by Hydroelectric Project facilities and operations include:

- physical processes that operate within the stream channels, such as streamflow effects on aquatic habitat, coarse-sediment routing, and maintenance of subsurface water levels in riparian habitat;
- heating and cooling processes in the streams; and
- biological processes, such as fish migration, homing and straying of anadromous salmonids, and fish spawning and rearing.

The alteration of these processes has affected steelhead and salmon populations in a number of ways, including:

- limiting the amount of habitat available for spawning and rearing,
- limiting access to available habitat, and

- causing warmer water temperature above levels tolerable to sensitive life stages of salmon and steelhead and altering the stability of the temperature regime on the South Fork by making the powerhouse operations such a dominant dynamic influence on temperature.

Restoration of these ecological processes is expected to facilitate the recovery of steelhead and winter-, spring-, fall-, and late fall–run Chinook salmon because it would provide:

- improved amounts of otherwise production-limiting spawning and rearing habitat;
- unimpeded access by anadromous salmonids to their preferred habitats,
- instream water temperature profiles that are improved and approach the magnitude and thermal continuity of those conditions under which anadromous fish populations have evolved in Battle Creek, and
- unambiguous environmental cues used by salmon and steelhead to migrate that reflect the magnitude and distribution of those conditions under which anadromous fish populations have evolved in Battle Creek.

The following sections describe the construction schedule and activities proposed for the Restoration Project at North Battle Creek Feeder, Eagle Canyon, Wildcat, South, Inskip, Coleman, Lower Ripley Creek Feeder, and Soap Creek Feeder Diversion Dam sites.

The Restoration Project involves abandoning some project sites. At these locations, the legal easements will need to be modified or retired and the associated responsibilities shifted from PG&E to the landowner. The details of the conditions have not been finalized and are described only to the level of detail known at this time. Additionally, the acquisition of permanent and temporary easements is in preparation, and these easements are described only to the level of detail known at this time.

Construction Schedule

Construction of the Restoration Project is anticipated to begin in spring 2005 and end by summer 2008. These dates and those that follow in the project description are current as of the publication of this document, but are subject to change. The current construction schedule for each project site follows:

- North Battle Creek Feeder Diversion Dam—Begin construction in May 2005 and end by September 2006.
- Eagle Canyon Diversion Dam—Begin construction in May 2005 and end by September 2006.
- Wildcat Diversion Dam—Begin construction in July 2005 and end by October 2005.

- South Diversion Dam—Begin construction in August 2007 and end by January 2008.
- Soap Creek Feeder—Complete construction during August 2007.
- Inskip Diversion Dam/South Powerhouse—Begin construction in June 2006 and end by February 2008.
- Lower Ripley Creek Feeder Diversion Dam—Complete construction during July 2006.
- Coleman Diversion Dam/Inskip Powerhouse—Begin construction in May 2005 and end by July 2008.

North Battle Creek Feeder Diversion Dam

Project Elements

Proposed features at the North Battle Creek Feeder Diversion Dam site include:

- fish ladder,
- fish screen,
- access road improvements,
- raising the left side of the dam, and
- building a footbridge across the stream.

The features proposed for North Battle Creek Feeder Diversion Dam for the Restoration Project are shown on Figure 2-3. The proposed construction area for the North Battle Creek Feeder Diversion Dam site is presented on Figure 1 in Appendix G.

Fish Ladder

For the Restoration Project, a new pool and chute fish ladder would be constructed near the center of the existing dam, requiring removing the steel portion of the Steeppass fish ladder, plugging the west section in the dam, and removing the sluice gate. The concrete ladder would be left in place to buttress the dam. A section of the left side of the dam would be reconstructed to accommodate the new fish ladder and sluice gate. The new fish ladder is designed in accordance with agency-prescribed parameters in order to function in a failsafe manner for creek flows up to 1,100 cfs, the design flow. Generally, a fish ladder is designed to convey 10% of the creek flow (in this case, a maximum of 110 cfs), which will adequately attract the fish to the ladder. The design features a 3-foot-wide contracted weir centered in each of the eight baffles, sloped weirs on both sides of the contracted weir, and 20-inch-square orifices below the sloped weirs (the left orifice is furnished with a manually operated

gate). The new ladder would be 69 feet long (each pool is 8 feet long and 15 feet wide), including a 5-foot-long bay at the top of the ladder where stanchions and flashboards can be installed to isolate the fish ladder for sluicing and debris removal. To facilitate maintenance, a 3-foot-wide movable walkway would spread across the ladder walls and could be positioned as needed along the wall to allow workers to make gate adjustments or remove debris. A catwalk would be provided along the left wall for access. The proposed ladder is about 17 feet wide (outer wall to outer wall). A new sluice gate would be installed in the dam immediately to the left (looking downstream) of the new fish ladder. Sensors would be included in the ladder to allow automatic operation of the control gates during high flows. Other sensors would be incorporated into the ladder and fish screen to ensure minimum instream flow requirements are met. Video monitoring equipment would also be included for biological monitoring.

Fish Screen

For the Restoration Project, the proposed new in-canal, flat-bar fish screen is designed to pass the maximum potential diverted water right of 55 cfs while meeting NOAA Fisheries and DFG salmon and steelhead screening criteria. The existing diversion concrete headworks structure would be modified with a concrete box section to accommodate the new screen configuration. The new screen box would be placed on the left bank to minimize excavation into the canyon wall. The new screen box would extend for about 140 feet downstream of the dam and would vary in width from about 5 feet to about 15 feet. A 3-foot-wide working platform would be included along the screen for maintenance purposes. A jib crane would be mounted on top of the raised left headwall of the dam to allow equipment and materials to be lifted from the screen deck to the new footbridge.

The total screen length would be 81 feet, consisting of 27 three-foot-square wedge-wire panels. Louvers would be installed behind the screen to provide uniform velocity control along the face of the screen. The screen would include a 7.5-cfs fish bypass. This bypass feature would consist of a 15-inch-wide weir, drop box, and an 18-inch-diameter seamless smooth wall pipe. The fish bypass flow would drop 4 feet into an energy-dissipating drop box, from which the bypass pipe exits and dumps into the creek. The exit of the bypass pipe into the creek would be free-flowing and set at an elevation such that adult fish cannot enter the bypass pipe. The bypass pipe then discharges into the creek near the end of the new concrete screen box.

Failsafe fish screen elements are incorporated into the design and operation of the diversion system. The water diversion would be automatically shut off whenever the fish screen fails to meet design or performance criteria until the fish screen is functioning again. The screen would be equipped with stage sensors on both sides of the screen to measure head differential. If a problem is detected, the sensors would trigger an activation of the screen-cleaning mechanism (motorized sweeping brushes), and/or send an alarm. If the problem continues, the diversion will be shut down. Installation of the new screen would require removal of about

130 feet of flume section. The new screen box would transition into the existing flume. This transition section may require reconstruction of a limited number of flume support piers.

Access Road Improvements

For the Restoration Project, construction of a new access road would be required for heavy equipment to access the dam during construction and for future daily operation and maintenance needs. The proposed new road would begin as an extension of the first leg of the existing access road leading to Volta 2 Powerhouse and would be approximately 554 feet long and 10 feet wide. The road would traverse down the slope for about 370 feet where it would switch back, leading to the right abutment of the dam. The road itself would be about 10 feet wide, with cut slopes affecting a footprint up to 40 feet wide. The road would be paved and would include drainage features that would direct runoff to the stream. At the base of the proposed new road, a permanent, flat landing area would be developed that allows the operation of heavy construction equipment. This landing area would be approximately 30 feet long and 22 feet wide with the outer edge reaching to the edge of stream. This landing area would be built up with the waterside edge retained by riprap slope protection. The landing area would be paved with asphaltic concrete. At the switchback, a 25-foot spur would facilitate traffic control and turning. The road would be all in cut sections, except at the terminus where the landing is developed. The road would be paved with a 6-inch base gravel material overlain by a 4-inch asphaltic concrete.

The flat landing area at the terminus of the new road would incorporate a foot access bridge that crosses the creek at the dam. This footbridge would have a traveler rail that could be used to carry heavy loads (e.g., 200-pound screen panels) from the left side of the dam, where the new screen would be located, to the right abutment of the dam, where the road access would allow removal of any mechanical or other features of the new screen and ladder for off-site maintenance.

Construction Considerations

Construction activities potentially would affect the following areas near North Battle Creek Feeder Diversion Dam:

- **The lightly paved access road from Wilson Hill Road to the feeder canal between Volta 1 and Volta 2 Powerhouses**. This road would experience heavy construction traffic. This 3,100-foot-long, 15-foot-wide road would not be widened but would be maintained as necessary during construction and would be repaired to its preproject condition at the end of construction. The total area affected would be approximately 46,000 square feet.
- **Portion of the access road along the feeder canal to the sediment trap at the penstock intake.** This 20-foot-wide-by-900-foot-long, gravel-surfaced

road would be heavily used but not widened. It would be maintained by blading and the addition of gravel as necessary. The total area affected would be approximately 18,000 square feet.

- **Staging area near the sediment trap and along the access road.** This area would be used and maintained as required. The total area affected would be approximately 88,000 square feet.
- **Temporary access road**. A 20-foot-wide, 1,200-foot-long road would be constructed to a new 100-foot-by-50-foot temporary staging area on the west canyon rim above North Battle Creek Feeder Diversion Dam. This staging area would be used to deploy trucked-in equipment and supplies down to the work site by helicopter. Clearing vegetation, grading the site, and adding gravel surfacing would be necessary. The total area affected would be approximately 29,000 square feet.
- **Disposal area between sediment trap staging area and temporary access road**. A 400-foot-by-250-foot area would be used to permanently dispose of soil and rock excavated for the new access road, fish screen, and fish ladder. The disposal piles would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures to prevent turbid runoff from escaping the disposal site. Clearing vegetation, grading the site, and adding gravel surfacing would be necessary. The total area affected would be approximately 100,000 square feet. Materials containing metal would be disposed of off site.
- **Temporary staging area.** An approximately 1-acre site adjacent to PG&E's Manton Service Office would be used as a temporary staging area for deploying selected materials, such as the prefabricated footbridge. The helipad at this location may also be used. Minimal site-grading may be required to allow use of this site. The total area affected would be approximately 44,000 square feet.
- **The paved "upper" segment of the steep access road to Volta 2 Powerhouse.** Traffic on this road segment would be extensive. No improvement is anticipated for this 12-foot-wide-by-400-foot-long segment. The traveled surface may require pothole repair and other maintenance during construction. After construction, additional repairs, including repaving, may be necessary. The total area affected would be approximately 5,000 square feet.
- **The paved "lower" segment of the steep access road to Volta 2 Powerhouse.** Traffic on this 12-foot-wide-by-500-foot-long segment would be limited and would be only light construction traffic. This segment must be kept open and available for PG&E use. The total area affected would be approximately 6,000 square feet.
- **New paved access road.** A new 10-foot-wide, 554-foot-long, paved access road would be constructed from the switchback between the upper and lower segments of the Volta 2 Powerhouse road down to the "landing" area adjacent to the right abutment of North Battle Creek Feeder Diversion Dam. Because of the overall steepness of the canyon wall (36-degree slope), a relatively large area would be affected by the excavation cutslopes in order to

ensure their stability. Total area affected would be approximately 37,000 square feet.

- **Area within creek channel high-water surface extending about 400 feet upstream of North Battle Creek Feeder Diversion Dam.** Diversion banks and other water control systems would be required to allow construction of the fish ladder and fish screen structures in the dry. The total area affected would be approximately 21,000 square feet.
- **Area within creek channel downstream of North Battle Creek Feeder Diversion Dam.** This area, extending about 150 feet downstream from the dam, would be disturbed by construction of the fish facilities. The left abutment for the new footbridge would extend up the left canyon wall about 80 feet east of the existing headworks. The total area affected would be approximately 18,000 square feet.
- **Use of helicopters.** The dam site is in a remote area with no nearby vehicle access. Certain construction equipment and materials, and materials to be permanently removed from the site, may be brought to or removed from the site by helicopter. These materials would be picked up or dropped off at identified staging areas.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, and repaired or repaved if necessary. Staging areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

The sequence of construction for the North Battle Creek Feeder site would roughly follow this order:

- stabilize south canyon face to prevent rockfall hazards to construction work and final facilities;
- construct new access road and landing area;
- build cofferdams and temporary water bypass structures;
- prepare site by demolition of existing facilities, including sluice gate, headworks, and pertinent sections of the dam and by excavation for structures, including removing boulders;
- perform concrete work for new screen and ladder;

- install metalwork for screen and ladders;
- install and test mechanical and electrical systems; and
- remove cofferdams and complete site restoration.

Construction at this site would occur over a 17-month period, with one winter shutdown lasting approximately 7 months. Construction is anticipated to begin in May 2005 and end by September 2006. Water diversions into the feeder canal would be interrupted to allow construction to be performed.

Eagle Canyon Diversion Dam

Project Elements

Proposed features at the Eagle Canyon Diversion Dam site include:

- a vertical-slot fish ladder,
- fish screen,
- powerline relocation,
- access trail improvements, and
- spring collection facilities improvements.

The features proposed for Eagle Canyon Diversion Dam for the Restoration Project are shown on Figure 2-4. The proposed construction area for the Eagle Canyon Diversion Dam site is presented on Figure 2 in Appendix G.

Fish Ladder

For the Restoration Project, the existing Alaska Steeppass fish ladder would be removed. A section of the south side of the dam, approximately 7 feet deep and 10 feet wide, would be removed where the new fish ladder would be built. A new modified headwall structure would be constructed to accommodate the new ladder as well as the new fish screen. The new modified canal and fish ladder intake area is designed to divert large floating debris away from the headworks so that debris does not collect in the fish ladder and screen system. A floodwall, extending above the 100-year flood event elevation, would be constructed at the upper end of the ladder to protect the new fish passage facilities. The new diversion headworks would include new electric gates, trash racks, electrical controls, and monitoring systems. Sensors would be included in the ladder to allow automatic operation of the control gates in times of high flows. Other sensors would be incorporated into the ladder and creek to ensure minimum instream flow requirements are met. Video monitoring equipment would also be included for biological monitoring.

The new vertical slot–type ladder would extend nearly 110 feet downstream from the dam. The combined new canal and ladder would project up to 30 feet into the stream channel and require excavation into the streambed to a depth of between 15 and 20 feet. The ladder is designed to operate properly with a minimum flow of 20 cfs and a maximum flow of 71 cfs, in accordance with agency-prescribed parameters in order to function in a failsafe manner for the creek design flow. Two ladder entrance locations are provided for flexibility of operation during varying tailwater conditions. The upstream entrance is designed to be open during low flows when the pool near the base of the dam is stable. When pool conditions are turbulent, the low-flow slot could be closed and the high-flow slot opened. The high-flow slot is designed to attract fish to the entrance pool rather than continue upstream into the shear velocity zone created by the swifter, highly turbulent water near the base of the dam. The entire length of the ladder would be covered with grating to prevent debris from entering the ladder.

Fish Screen

Construction of a new fish screen would require removing the upstream 100-foot section of canal and replacing it with an enlarged canal section. A common wall would be constructed to serve as a canal wall and a side wall for the fish ladder. The new in-canal, flat plate fish screen is designed to divert a flow of up to 70 cfs while meeting screen criteria set by NOAA Fisheries and DFG for both salmon and steelhead. The screen system would incorporate a bypass return system designed to operate with a flow of 5 cfs while meeting screen criteria. The bypass system is designed to return the fish to a drop well outside of the ladder turning pool. From the drop well, the fish would be able to enter the turning pool of the ladder through a slot. The screen face consists of wedge-wire removable panels with a total length of 63 feet. Fourteen square-shaped fish screen panels 4 feet 6 inches wide and high enclose the entrance. Louvers would be constructed behind the screen to provide uniform velocity control along the full face of the screen. The screen has a reinforced concrete foundation with structural steel frames placed at 9-foot intervals. Failsafe fish screen elements are incorporated into the design and operation of the diversion system. The water diversion will be automatically shut off whenever the fish screen fails to meet design or performance criteria until the fish screen is functioning again. Stage sensors on both sides of the screen would measure head differential. If a problem is detected, the sensors would trigger an activation of the screen-cleaning mechanism (motorized sweeping brushes), and/or send an alarm. If the problem continues, the diversion would be shut down.

Powerline Relocation

Currently, power is provided to the site by a line extending down into the canyon from a power pole located on the north rim of the canyon. The power pole located at the canyon bottom stands near the base of the access stairway. This pole would be relocated approximately 30 feet downstream and may be

temporarily removed during construction. Portable generators would provide power to the site during construction. The powerline will be reconnected upon completion of construction.

Access Trail Improvements

Access to the site is currently limited to foot access along an extended trail on the south rim of the canyon, which begins at the top of the plateau and leads down to the creek. For construction, operation, and maintenance, this foot trail would be improved. Improvements include strengthening or adding handrails, strengthening or repairing stair steps, adding foot traffic grip-strut grating at selected locations, stabilizing loose rocks in the footpath, providing adequate drainage to improve footing, and equipping the path with lighting. Improvements would occur in the general vicinity of the existing trail.

Improvements to Spring Collection Facilities

Historically, PG&E collected spring water originating from numerous locations along the cliff face of the access trail and conveyed it to the Eagle Canyon Canal flume and Tunnel No. 2. This spring water now bypasses the collection system and is returned to the North Fork under the terms of an interim flow agreement (see Chapter 6). However, many of the collection facilities remain. For the Restoration Project, broken and abandoned pipe collection facilities would be removed and other collection features would be modified to facilitate drainage along the trail and to ensure that spring water collected is returned to the creek. Some of the existing collection facilities consist of small channels (about 6 inches wide by 3 inches deep) cut along sections of the rock cliff face. These channels will be left in place.

Construction Considerations

Construction activities potentially would affect the following areas near Eagle Canyon Diversion Dam:

- **Primary access road to work site.** Access is from the south over the existing dirt road off Manton Road. This 15-foot-wide, 5,300-foot-long road would be graded, vegetation may be removed or trimmed, and gravel surfacing may be added as necessary to allow all-weather access during construction. The total area affected would be approximately 80,000 square feet.
- **Entrance to primary access road.** The entrance would be modified to ensure safe access to the site because stopping distances for cross traffic are inadequate and the apron is too short. The gate and fences would be widened and set back 100 feet. The culvert pipe that provides drainage along Manton Road would be removed and replaced with a longer section. The entrance

area would be graded to promote drainage and compacted to provide an adequate foundation for placement of asphaltic concrete. Vegetation may be removed or trimmed. The total area affected would be approximately 15,000 square feet.

- **Area on the south rim of the canyon at the end of the access road.** This 50-foot-wide-by-480-foot-long area would be cleared of vegetation and graded and graveled as necessary to serve as a staging area. The total area affected would be approximately 24,000 square feet.
- **Access road to the north canyon rim.** This 15-foot-wide-by-4,800-foot-long road may be graded and graveled. The total area affected would be approximately 72,000 square feet.
- **Area on the north rim of the canyon at the end of the access road.** This 120-foot-wide-by-200-foot-long area may be cleared, graded, and graveled to serve as a staging area. The total area affected would be approximately 24,000 square feet.
- **Footpath from the south canyon rim down to Eagle Canyon Diversion Dam.** This footpath would serve as the primary access route for personnel. This 1,000-foot-long trail would be improved to provide safer access during and after construction. The location of the footpath would remain the same; therefore, disturbance to this area would be limited to a maximum 10-foot width. The total area affected would be approximately 10,000 square feet.
- **Improvements to spring collection facilities.** Work required for the removal of the spring collection facilities on the south canyon wall would extend from Eagle Canyon Diversion Dam at Eagle Canyon Canal station 0+00 to station 29+18. At least 21 collection points and 11 discharge points would be modified. Access to these points would be over the existing access road on the canyon rim above the flumes and tunnels and by existing paths, trails, and flume walkways and stairs. These access ways would not be altered to obtain access. The access roads to the turnaround areas at each trailhead may be graded and graveled. The individual improvement areas for the affected collection elements would vary with the required work. The total area to be affected is estimated to be approximately 9,000 square feet.
- **South canyon face.** Several areas on the south canyon face present a potential rockfall hazard to construction work and the final facilities. The actual amount of affected canyon face would depend on ongoing stability assessments. If work is required at a specific area (e.g., removal by barring and scaling), access may be from above or from the side. A total area of 65,000 square feet has been estimated, but the actual area affected may be substantially less.
- **Area within the creek channel high-water surface extending about 200 feet upstream of the dam**. Diversion banks and other water control systems would be required for construction of the fish ladder and fish screen structures in the dry. The total area affected would be approximately 14,000 square feet.

- **Area within the creek channel downstream of Eagle Canyon Diversion Dam.** This area would be disturbed by the construction of the fish facilities, which would extend about 180 feet downstream of the dam. Total area affected would be approximately 18,000 square feet.
- **Use of helicopters.** There is no vehicle access to the dam site. All construction equipment and materials heavier than can be carried by workers along the footpath would be transported to and from the site by helicopter. Materials to be permanently removed from the sites would be transported by helicopter and dropped off at identified staging areas.
- **Disposal of materials.** Debris from construction and dam removal activities will be removed from the stream channel and deposited off site. Debris will be removed to the extent that it will not affect conditions supporting upstream migration of juvenile and adult steelhead and Chinook salmon at minimum flow releases from upstream dams and will not adversely modify spawning (e.g., armoring) or rearing habitat. A qualified fish biologist will inspect the stream channel and confirm the restoration of habitat conditions. Common excavation composed of sediments would be temporarily stockpiled in the work zone and then reused as backfill.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, and repaired or repaved if necessary. Staging areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

The sequence of construction at Eagle Canyon Diversion Dam would roughly follow this order:

- construct new access road entrance and trail improvements;
- build cofferdams and temporary water bypass structures;
- prepare site by demolition of existing facilities, including fish ladder, headworks, and pertinent sections of the dam and by excavation for structures, including removing boulders;
- construct new headworks;
- perform concrete work for new screen and ladder;
- install metalwork for screen and ladders;

- install and test mechanical and electrical systems; and
- remove cofferdams and complete site restoration.

Construction at this site would occur over a 17-month period, with one winter shutdown lasting approximately 7 months. Construction is anticipated to begin in May 2005 and end by September 2006. Water diversions into the canal would be interrupted to allow construction to be performed.

Wildcat Diversion Dam, Wildcat Canal, and Wildcat Pipeline Area

Project Elements

Project elements for the Wildcat Diversion Dam site include:

- removal of Wildcat Diversion Dam;
- removal of appurtenant dam facilities, including Wildcat Canal; and
- sediment management.

The proposed construction area for the Wildcat Diversion Dam site is presented on Figure 3 in Appendix G.

Wildcat Diversion Dam Removal

For the Restoration Project, Wildcat Diversion Dam would be demolished and removed to improve fish passage to the North Fork Battle Creek. Removal of the existing masonry rock structure would involve demolishing the rock/mortar matrix into pieces no larger than 1 to 2 feet in size, similar to existing cobble material transported within the river system. The resulting 70 cubic yards of material would be spread over an area extending about 100 feet downstream from the dam site. The material would be placed along and within the creek channel in a manner that would not hinder fish passage or flow. Natural stream floodflow would distribute the material throughout the downstream river system. The streambed would be restored to preproject conditions.

Appurtenant Facility Removal

Appurtenant facilities that would be removed under the Restoration Project include:

- masonry intake structure;

- all electrical and mechanical items, including the gates and associated controls;
- steel Alaska Steeppass fish ladder;
- original concrete ladder structure;
- handrails, metal walkways, and other miscellaneous metalwork;
- Wildcat Pipeline and associated support structures and selected footings;
- Wildcat Canal;
- powerline and associated power poles.

The disposition of each of these appurtenant facilities under the Restoration Project is described below.

The masonry intake structure would be broken up, removed from the stream channel, and deposited off site. There are about 40 cubic yards of material in the intake structure. A thin concrete cap on top of the intake structure contains less than 3 cubic yards of material. This concrete cap would also be removed and deposited off site. Debris will be removed to the extent that it will not affect conditions supporting upstream migration of juvenile and adult steelhead and Chinook salmon at minimum flow releases from upstream dams and will not adversely modify spawning (e.g., armoring) or rearing habitat. A qualified fish biologist will inspect the stream channel and confirm the restoration of habitat conditions.

Any metalwork associated with the intake structure and dam, including trash racks, 36-inch-diameter slide gate, hoist, 30-inch pipe, mechanical controls, and electrical controls, would be removed and either salvaged by PG&E or disposed of at the nearest approved commercial disposal site. In addition, the 24-inch-diameter sluice gate within the dam section would be removed and disposed of or salvaged.

The steel Alaska Steeppass fish ladder set into the original concrete fish ladder would be removed, cut up, and disposed of at the nearest approved commercial disposal site. The original concrete fish ladder would be broken up into pieces no larger than 1 to 2 feet in size. Concrete pieces that contain steel reinforcement would be removed and disposed of at the nearest approved commercial disposal site, and the remaining concrete rubble would be removed to the extent that it will not affect conditions supporting upstream migration of juvenile and adult steelhead and Chinook salmon at minimum flow releases from upstream dams and will not adversely modify spawning (e.g., armoring) or rearing habitat. A qualified fish biologist will inspect the stream channel and confirm the restoration of habitat conditions.

The foot trail leading from the top of the canyon to the dam site would remain. The metal walkway at the end of the access trail and other miscellaneous metalwork, the stream gage below the dam, and the power line to the site would also be left in place.

Approximately 5,390 feet of the 24-inch Wildcat Pipeline (total of 5,530 feet) and steel support framework would be removed from the stream channel. Approximately 140 feet of the pipeline and support structure would be left in place to provide the local landowner access across Juniper Gulch. Within this section all concrete piers, steel supports, and miscellaneous metalwork would remain. All other concrete piers along the pipeline alignment would be left in place; however, all timber and steel supports would be removed. The protruding portions of any steel bolts embedded in the concrete piers (these bolts currently attach the steel support structure to the piers) would be cut off flush with the surface and removed. In addition, in a few places along the length of the pipe, the structure is anchored into the canyon wall. All of these anchor bolts would be cut off at the rock surface and the ends removed.

Wildcat Canal would be filled in except for specific sections, which would be left unfilled either at the request of the landowners or as a means to control natural drainage that enters the canal from upslope. Captured drainage water would be conveyed to selected discharge points. This would help control flooding or erosion of downslope lands. Wildcat Pipeline ends at a concrete header box at which the pipeline transitions into a canal section. The concrete header box would be left in place. From the header box, the first 1,465 feet of the canal would be filled in. This section of canal is earth-lined. The depth of filling the canal would depend on several considerations. To minimize construction costs, the goal would be to fill the canal with the adjacent canal bank material that came from the original canal excavation. The existing canal bank would be excavated to a depth that fills in the canal to the same height. This would result in a wide, slightly sloped surface that would prevent ponding, allow cross-slope drainage to continue downslope, allow vehicle access, and prevent animals from becoming trapped. The width of the bank excavation would be adjusted locally to avoid root zones of adjacent trees. Import of fill materials would be minimized. Any imported materials that might be needed would be obtained from the stream channel or from excess excavated materials (materials that would otherwise be disposed of on site) from other work sites, such as at the Coleman Diversion Dam/Inskip Powerhouse site (connector pipeline and bypass pipeline excavation).

About 1,465 feet downstream of the header box, double culverts drain into the left side of the canal. Upslope natural runoff enters the canal at this point. Just upstream of these double culverts, the canal filling would be terminated. Runoff from the double culverts would still be allowed into the canal section at this point. The canal section would be left open for about 620 feet downstream, where the canal would be breached to allow this drainage water to flow into another natural drainage gulch running downslope of the canal. The canal immediately downstream of this point would be plugged to force the runoff water through the canal breach and into the natural drainage. Beyond this point, the canal would be filled to Wildcat Road by excavating the canal bank and filling-in the canal as described above. In this section, the right side of the canal (looking downstream) is concrete-lined. This concrete lining would be broken up and buried in the canal section as it is filled. At Wildcat Road, the canal transitions into a pipe culvert to convey water underneath the road. This culvert would be

plugged. Wildcat Canal continues for about another 1,500 feet to Coleman Canal. Below Wildcat Road the canal section would be filled in for about the first 440 feet. Downstream of this point, the canal begins collecting a large amount of natural drainage. This remaining section of earthen canal would be left open. East of Wildcat Road the reconfigured canal road, which is used by the landowner, would be graded and graveled upon completion of the removal and reconstruction activities.

Sediment Management

The existing sediment behind Wildcat Dam would not be removed. No significant quantities of fines exist in the sediments behind the dam, and turbidity is not expected to be a problem. No hazardous material contamination problems are expected in the sediments. These sediments would be left in place for floodflows to distribute the primarily cobble material throughout the river system downstream. It is expected that this material would serve as suitable habitat for aquatic resources.

Construction Considerations

Construction activities potentially would affect the following areas near Wildcat Diversion Dam, Wildcat Canal, and pipeline:

- **The intersection of the access road with Battle Creek Bottom Road.** This intersection would be widened, graded, and graveled. Fences and gates would be modified to facilitate the movement of construction equipment and personnel. The total area affected would be approximately 5,000 square feet (50 feet by 100 feet).
- **Access road from Battle Creek Bottom Road that proceeds south to the dam.** This 4,400-foot-long, 15-foot-wide road would be bladed and graveled as necessary to facilitate access. This area may be used for helicopter staging. The total area affected would be approximately 66,000 square feet.
- **Parking area on the north abutment above the dam site.** This parking area would be graded and graveled as necessary to serve as a staging area. This area would be used for helicopter staging. The total area affected would be approximately 5,000 square feet.
- **Footpath from parking area to dam site.** This footpath would be improved as necessary to allow safe and efficient access for construction workers. Improvements may include rebuilding or adding to existing steps and stairs, shoring up or adding new handrails, and trimming or removing vegetation. The footpath is too narrow for bringing equipment to the work site. The total area affected would be approximately 5,000 square feet.

- **Wildcat Diversion Dam.** Work required below the canyon rim for the removal of Wildcat Diversion Dam would be limited to an approximate 100-foot width across the canyon and extend 100 feet downstream from the dam and 250 feet upstream of the dam. The total area affected would be approximately 35,000 square feet.
- **Overhead powerlines.** The overhead powerlines and poles to be removed drop to the dam site from the top of the left canyon. An access road off of Manton Road follows the lines and would be used to accomplish the removal work. The total area affected would be approximately 6,000 square feet.
- **Wildcat Pipeline.** Work required for the removal of the Wildcat Pipeline would be limited to the 5,500-foot-long pipeline corridor that averages 20 feet wide. The total area affected would be approximately 110,000 square feet.
- **Wildcat Canal.** Work required for the abandonment of the Wildcat Canal would be limited to a 70-foot-wide corridor along the portion of the canal from the pipe outlet box to 440 feet west of Wildcat Road, for a total of 3,200 feet. The total area affected would be approximately 224,000 square feet.
- **Staging area that may be established on private property adjacent to Wildcat Road.** The area would require grading, graveling, and fence and gate modifications. This area would be used for helicopter staging. The total area affected would be approximately 44,000 square feet.
- **Use of helicopters.** Both the dam site and pipeline alignment are in remote areas with no nearby vehicle access. All construction equipment and materials heavier than can be carried by workers along the footpath would be transported to and from the site by helicopter. Materials to be permanently removed from the sites would be transported by helicopter. These materials would be picked up or dropped off at identified staging areas.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, and repaired or repaved if necessary. Staging areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

The sequence of construction at the Wildcat Diversion Dam would roughly follow this order:

- cut Wildcat Pipeline about 100 feet downstream of dam to allow draining of reservoir area through outlet,
- remove sluiceway gate to lower reservoir level further,
- construct upstream cofferdam,
- remove old fish ladder and notch dam to streambed grade to further reduce reservoir level,
- remove remainder of dam,
- remove last section of walkway (metalwork),
- remove pipeline concurrently with dam removal activities,
- fill in Wildcat Canal and complete remaining reconfiguration of canal for drainage and access road concurrently with dam removal activities, and
- remove upstream cofferdam and complete site restoration activities.

Construction at this site would occur over a 4-month period. Construction is anticipated to begin in July 2005 and end by October 2005.

South Diversion Dam and South Canal Areas

Project elements for the South Diversion Dam site include:

- removal of South Diversion Dam;
- removal of appurtenant dam facilities, including South Canal;
- improving site access; and
- sediment management.

The proposed construction area for the South Diversion Dam is shown on Figure 9 in Appendix G. The area affected by decommissioning South Canal is presented on Figures 7, 8, and 9 in Appendix G.

Project Elements

South Diversion Dam Removal

For the Restoration Project, South Diversion Dam would be completely removed, including both the overflow section and the non-overflow sections with special consideration for some of the intake structure and appurtenant facilities as described below. The steel plate cap and steel bin-wall components of the dam would be removed. The gravel and cobble material filling the bins would be removed and spread downstream of the dam over about a 100-foot distance. Some of the streambed materials may be used to fill portions of South Canal. All

concrete would be removed from the stream channel. Concrete containing steel reinforcement would be disposed of off site in an approved commercial disposal site. Concrete not containing steel would be disposed of off site or broken up into 1- to 2-foot-size fragments and buried in portions of South Canal.

Appurtenant Facility Removal

Portions of a reinforced concrete intake structure to South Canal would be retained on the right abutment of the dam to allow the gate to inlet portal (Tunnel No. 1) to be welded closed. The radial sluice gate on the right abutment would be removed and either salvaged or disposed of off site. The South Canal intake structure trashrack and slide gate operator would be removed. The steel denil-type fish ladder that is attached to the downstream face of the overflow crest structure would be removed and either salvaged or cut into sections and disposed of off site. Miscellaneous handrails, ladders, and metal walkways associated with the canal intake structure or along the trail leading to the structure would be removed and salvaged or disposed of off site.

South Canal

The metal canal flume sections along South Canal would be disassembled and bundled for removal by helicopter. Spillway sections, feeder pipes, access walkways, stairways, and other miscellaneous metalwork also would be removed. Because of the remoteness of the work sites and the general lack of vehicle access, helicopters would probably be used to airlift metal items between staging areas near the access roads and the work sites. These items would be removed from the work sites and salvaged or disposed of off site. The reinforced concrete flume footings generally would be left in place. However, some footings that are visible from South Fork Battle Creek would be removed from the site and disposed of off site. With the approval of the landowner, a few potentially unstable tall footings would be knocked over, broken up, and left on site.

The tunnel sections along the South Canal would be closed with angle iron gates to prevent people from entering the tunnels but also allow bats to access the tunnels. The Tunnel No. 1 inlet portal would be sealed by welding the intake gate shut. It may be decided to cave in smaller sections of tunnel because they are not useful as habitat. The gates would be designed in accordance with current guidelines for promoting bat habitat and may include partial closure of the portal with concrete to optimize airflow and climate within the tunnel. The tunnel closures would incorporate drainage features at the base to prevent buildup of any groundwater within the closed tunnel.

The open-channel sections of South Canal would be filled in. The depth of filling the canal would depend on several considerations. To minimize construction costs, the goal would be to fill the canal with the adjacent canal bank material that came from the original canal excavation. The existing canal

bank would be excavated to a depth that fills in the canal to the same height. This would result in a wide, slightly sloped surface that would prevent ponding, allow cross-slope drainage to continue downslope, allow vehicle access, and prevent animals from becoming trapped. The width of the bank excavation would be adjusted locally to avoid root zones of adjacent trees. Importing of materials to accomplish filling would be minimized. Any imported materials that might be needed would be obtained from the stream channel, the South Dam bin-wall fill, or excess excavated materials (materials that would otherwise be disposed of on site) from other work sites, such as at the Inskip Diversion Dam/South Powerhouse site (tunnel and access road excavation). Some portions of the open-channel sections are formed by vertical concrete walls. Concrete walls not containing steel would be broken up and buried in the canal. Concrete walls containing steel would be removed and disposed of off site. Where natural drainages occur in the existing canal system, the runoff would be conveyed across the old canal alignment to the natural downstream drainage draws. Canal wasteways with downslope concrete aprons would be left in place.

Some clearing of vegetation adjacent to the canal may be required to facilitate access for the removal of flume sections and canal backfilling. A 20-foot clearing zone at various canal locations may be required, and trimming of trees or brushes outside of the 20-foot zone also may be required on a case-by-case basis. Also, minor areas of clearing or trimming of brush at locations not adjacent to the flumes, canal, or tunnel sections may be required to accommodate remote winch setup, helicopter access, and equipment access to canal sites.

The canal corridor is generally not fenced. However, fencing along canal corridors to prevent cattle from straying will be installed upon landowner request.

Access Road Improvements

Some creek channel and access road improvements would be necessary to accommodate the construction equipment required for dam and canal removal. The archaeological site identified along the access road to South Dam would be protected and left undisturbed. For all reaches of the access road, improvements would include smoothing and graveling road surfaces as necessary to support standard construction vehicle traffic. There are two locations along the access road at drainage crossings that would be excavated and graded to widen them enough to allow large construction equipment (e.g., dump trucks) to turn around. The switchback and parking areas near the end of the access road would be excavated, graded, and graveled to widen them enough to allow large construction equipment to easily access the work site. Access for construction equipment from the end of the existing road to the dam site would be developed over two possible routes. The first route would involve reestablishing an old access ramp near the parking area, which leads to a low-water crossing located approximately 740 feet downstream of the dam, and rehabilitating the existing construction haul road along the south creek bank to the dam abutment. The second route would involve widening the existing canal bank between the parking area and the outlet of Tunnel No. 1. A ramp would then be excavated

through the canal bank down to a terrace above the creek channel. Any fill material required to complete the ramp would be obtained from terraces above the creek channel. Some tree limbs or trees, as required, would be removed to facilitate equipment access.

Several existing access roads would be used to reach various points along or near South Canal. These existing roads would be graded and graveled as necessary to allow transporting personnel and small equipment to various locations along the canal to facilitate removal activities. Much of the 5.7-mile length of the canal cannot be reached practically by vehicles. In these areas, existing foot trails off of the access roads would be used by personnel, and equipment and materials would be brought to and from the site by helicopter. At several locations where it is practical, existing trails would be widened and graveled as necessary to allow construction equipment to reach the work site.

Sediment Management

The reservoir behind the dam is largely filled with sand, gravel, cobbles, boulders, and debris so that the depth of water averages between 2 and 3 feet below the dam crest. Most of the material is cobble size. These sediments would be left in place and allowed to be distributed downstream by natural floodflows. It is anticipated that only one normal flood season will be required to distribute these materials downstream. A pilot channel would be excavated in the sediments 500 feet upstream from the dam site to facilitate sediment flushing and to ensure that fish passage is adequate. The pilot channel would have a bottom width of approximately 8 feet and side slopes of approximately 3:1. The bottom slope of the channel would range from 8:1 to 10:1. Material excavated for the pilot channel would be spread in the river channel upstream of the dam.

Construction Considerations

Construction activities potentially would affect these areas near South Diversion Dam and the South Canal:

- **Area within creek channel high-water surface, extending about 500 feet upstream from South Diversion Dam**. Construction of a pilot channel for the excavated sediments, redistribution of the reservoir sediments within the areas upstream and downstream of the dam, and excavation of sediments to allow dam removal would affect this area. The total area affected would be approximately 72,000 square feet.
- **Area within the creek channel downstream of South Diversion Dam, including part of the access ramp on the downstream right creek bank.** This area would be disturbed by equipment crossing the creek to reach the dam removal area. The total area affected would be approximately 96,000 square feet.

- **Area along the left creek bank.** This area would be disturbed by regrading and by equipment crossing the creek to reach the dam removal area. The total area affected would be approximately 18,000 square feet.
- **Water conveyances.** The project width along the South Canal would be 70 feet for all three types of water conveyances used (open channels, flumes, and tunnels). The entire project width would not need to be disturbed during abandonment or removals. The entire 70-foot width may be needed for open channel sections, up to 40 feet for the flumes, and only 20 feet for tunnels, resulting in affected areas of 1,412,250 square feet for the 20,175 feet of open channel, 95,360 square feet for the 2,384 feet of flumes (total of nine flumes), and 152,260 square feet for the 7,613 feet of tunnels (total of 10 tunnels). The total area affected would be approximately 1,660,000 square feet.
- **Access roads to South Diversion Dam and South Canal.** Approximately 3 miles of unimproved public road (Ponderosa Way) would be affected by construction activities. The road would be bladed and graveled as needed to support construction equipment and maintain public access. The total area affected would be approximately 324,000 square feet. Improvements to the 2.3-mile private access road, which continues to South Diversion Dam and the eastern access points along South Canal, are described above. The total area affected would be approximately 234,000 square feet. The network of private unimproved access roads that branch off of the Bluff Springs gate to the middle and western portions of the South Canal would be bladed and graveled as needed to support construction equipment. The total length of this road network that is affected is approximately 3.6 miles, and the total area affected would be approximately 451,000 square feet. The portions of access roads that are along the canal banks are not included in these figures. These affected areas are included in the water conveyances estimate. The private South Powerhouse Access Road and Old Ranch Road also provide access to the western portions of South Canal but are addressed in the description for Inskip Diversion Dam/South Powerhouse site.
- **Use of helicopters.** The dam and canal sites are in remote areas with limited vehicle access. Certain construction equipment and materials and materials to be permanently removed from the site may be brought to or removed from the sites by helicopter. These materials would be picked up or dropped off at identified staging areas.

Overall, the type of equipment used for construction of this element would include bulldozers, excavators, cranes, loaders, backhoes, and other transportation vehicles.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, and repaired or repaved if necessary. Staging areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped

and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

Removal activities at the South Diversion Dam site would be accomplished roughly in the following order:

- close off diversion at South Diversion Dam by sealing inlet portal,
- remove any mechanical features to be salvaged or disposed of from the dam,
- remove South Diversion Dam,
- remove South Canal features concurrently with the dam removal, and
- complete site cleanup and restoration.

Construction at this site would occur over a 5-month period. Construction is anticipated to begin in August 2007 and end in January 2008.

Soap Creek Feeder

Project Elements

Proposed elements for the Soap Creek Feeder site include:

- removal of dam and appurtenant facilities, including pipeline and junction box where flow enters South Canal; and
- improving site access.

The proposed construction area for the Soap Creek Feeder site is presented on Figure 8 in Appendix G.

Soap Creek Feeder Diversion Dam

For the Restoration Project, Soap Creek Feeder Diversion Dam would be removed. All mechanical equipment would be either salvaged or disposed of off site. Dam materials not containing steel would be broken up into pieces no larger than 1 to 2 feet in size, hauled to the nearest South Canal open-channel site, and buried. These materials could be temporarily stockpiled until South Canal flows cease. Materials containing steel would be removed and disposed of off site. The dam would be removed to the existing streambed grade. The dam retains a

minor volume of sediments. A pilot channel would not be excavated. Natural creek flows would be sufficient to distribute the materials downstream. Cold spring water entering Soap Creek above the dam would be allowed to continue downstream of the dam site.

Soap Creek Appurtenant Facilities

The pipeline, which extends 291 feet downstream to a junction box (including a stilling well, a venturi flume, and a 27-foot-long No. 72 metal flume) would be removed from the site. The concrete piers that support the pipeline would be removed and disposed of off site.

Access Road Improvements

Road improvements would involve blading and graveling as described above for South Canal access.

Construction Considerations

Construction activities potentially would affect the following areas near Soap Creek Feeder Diversion Dam:

- **Existing access road off of Ponderosa Way.** This road would be bladed and graveled as described above for South Canal.
- **Staging area.** A staging area would be established to accommodate helicopter work. The proposed location would be established in the field but would be adjacent to the main access road at a flat spot at the top of the plateau after the turnoff from Ponderosa Way.
- **Staging area for the removal of Soap Creek Feeder Diversion Dam.** Work for the dam removal would be staged from a small area above the right abutment of the dam. This area and the access footpath leading down to the dam would be graded and shaped to establish safe access. The access path corridor would be minimized to about 20 feet wide. The total area affected would be approximately 5,000 square feet.
- **Area within the creek channel upstream and downstream of Soap Creek Feeder Diversion Dam.** This area would be disturbed during dam removal. The affected area would extend about 60 feet upstream and about 40 feet downstream from the dam and would be 40 feet bank to bank. The total area affected would be approximately 40,000 square feet.
- **Area of pipeline and associated structures.** Removal would be contained within a 15-foot-wide corridor between Soap Creek Feeder Diversion Dam and South Canal, a distance of about 300 feet. The total area affected would be approximately 4,000 square feet.

Equipment used for this element includes bulldozers, loaders, excavators, cranes, helicopters, and dump trucks.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, and repaired or repaved if necessary. Staging areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

Once the diversion gate is closed on Soap Creek Feeder Diversion Dam, removal of both the dam and appurtenant facilities could proceed concurrently. The sluice gate section within the dam would be left in place until the end to facilitate diversion of the creek water. Once the largest portion of the dam is removed, this final section would be taken out. Construction at this site would occur over a 1-month period. Construction is anticipated to occur during August 2007.

Inskip Diversion Dam/South Powerhouse

Project Elements

Proposed features at the Inskip Diversion Dam/South Powerhouse site include:

- Inskip Diversion Dam fish screen and ladder,
- Inskip Canal wasteway,
- South Powerhouse tailrace connector,
- South Powerhouse tailrace channel dike,
- access road improvements,
- power line relocations, and
- waste areas.

The features proposed for the Inskip Diversion Dam/South Powerhouse site for the Restoration Project are shown on Figure 2-5. The proposed construction area for the Inskip Diversion Dam/South Powerhouse site is presented on Figure 6 in Appendix G.

Project elements would be designed to improve fish passage at Inskip Dam, reduce diversion of fish into Inskip Canal, eliminate powerhouse tailrace discharges to South Battle Creek, and allow Union Canal flows to bypass South Powerhouse and enter Inskip Canal.

Inskip Diversion Dam Fish Ladder and Screen

Fish Ladder

The proposed fish screen and ladder would improve fish passage at Inskip Diversion Dam and flow diversion to the Inskip Canal. The proposed Half Ice Harbor fish ladder would be located on the north (right) bank of South Fork Battle Creek below Inskip Diversion Dam. Beginning at the entrance pool, the ladder would climb the northern stream bank in the downstream direction, roughly paralleling the streamflow, for a distance of about 200 feet, where it would turn perpendicular to the creek and climb the remaining elevation up the stream bank slope to tie into the Inskip Canal.

The exit pool of the fish ladder would be located immediately downstream of the fish screen and adjacent to the gate structure on Inskip Canal. Video monitoring equipment would be installed at the outlet pool for biological monitoring. A bypass channel would be provided to divert water around the fish screen, if needed. Auxiliary water would be collected from behind the fish screen, piped to the ladder entrance, and diffused up through the grating in the floor of the entrance pool. The design flow of the ladder is 39 cfs and would be supplemented by up to 131 cfs of auxiliary water.

The ladder would have pools 9 feet wide by 10 feet long and have both weir and orifice flow between consecutive pools. The weirs would be 5 feet wide, and the orifices would be 24 inches high by 24 inches wide. There is sufficient inflow to the site for the ladder to operate without adjustment in all but the very driest of years. If creek flows drop to the 20- to 25-cfs range, the orifices may need to be partly closed to maintain proper ladder hydraulics. Sensors would be included in the ladder to allow automatic operation of the control gates during high flows. Other sensors would be incorporated into the ladder and fish screen to ensure minimum instream flow requirements are met.

The creek bed would be excavated to a depth of approximately 5 feet to develop a pool at the ladder entrance. Some bedrock on the creek bank opposite the ladder may also need to be excavated to maintain desirable creek hydraulics. The top of the entrance pool would be covered with grating to prevent debris from being deposited within the ladder during large flow events.

An access road would be constructed on the north (right) creek bank to provide access for operation and maintenance of the fish ladder and screen. The new 12-foot-wide road would originate at a new parking area adjacent to the fish screen, continue upstream along the right bank of the creek, and terminate at South Powerhouse, where it would connect to the existing access road. A prefabricated railroad car bridge would be constructed across Inskip Canal, just downstream of

the new fish screen structure, for access to the fish ladder and entrance pool via a lower service road. Originating at the railroad bridge, the service road would run along the fish ladder and terminate at stream level near the entrance pool. Fill for the service road would extend approximately 50 feet toward the creek, measured from the south ladder wall. An upper service road, approximately 160 feet long, would tee off the lower service road, cross over the fish ladder, and terminate at the sluiceway. The road would provide access to the top of the fish ladder entrance chamber so staff can operate and maintain the entrance gates and install and remove stoplogs.

The entire northern stream bank slope, from the entrance pool roughly 50 feet below the dam downstream to about 1,100 feet below the dam, would be affected by construction activities.

The metalwork would be removed from the existing Alaska Steeppass fish ladder. The concrete portion of the original pool and weir ladder would remain in place, but the upper end would be blocked so upstream migrants are no longer attracted to the ladder.

Fish Screen

The proposed 121.5-foot-long flat plate fish screen would be constructed in Inskip Canal extending downstream from a point beginning about 190 feet below the diversion headworks. The fish ladder exit would be just downstream of the screen bypass. The proposed fish screen would have a capacity of 220 cfs under normal operating conditions. The water depth on the screen would be maintained at 6 feet to 7 feet depending on the creek stage. The base of the screen would be set 6 inches above the canal bottom to allow for some sediment collection without affecting the screen operation. Louvers would be installed behind the screen to provide uniform velocity control along the face of the screen. Sweeping velocities are expected to be 3 feet per second, resulting in an estimated time of 41 seconds for the fish to move past the screen. The framing system would support a removable, stainless steel, wedge-wire or equivalent screen meeting DFG and NOAA Fisheries fish screen criteria. A motorized sweeping-type brush assembly would clean the entire screen face. Multiple independent cleaning brush systems would be required to cover the full length of the screen within durations satisfying the criteria specified by DFG and NOAA Fisheries. Failsafe fish screen elements are incorporated into the design and operation of the diversion system. The water diversion would be automatically shut off whenever the fish screen fails to meet design or performance criteria until the fish screen is functioning again. The screen would be equipped with stage sensors on both sides of the screen to measure head differential. If a problem is detected, the sensors would trigger an activation of the screen-cleaning mechanism (motorized sweeping brushes), and/or send an alarm. If the problem continues, the diversion would be shut down. If this shutdown occurs, the auxiliary water supply would also be shut down to prevent dewatering of the downstream face of the screen.

Coordinated hydraulic control of the fish screen and ladder would be accomplished with the use of a series of vertical sliding gates located in the

canal. Through the range of design flows, the head differential between the creek and the canal can vary approximately 2 feet. Because only a 1-foot head differential is desired between any two pools in a fishway, two control structures are proposed. The first control structure is the headworks located at the dam. This structure is a set of two 6-by-6-foot automated vertical sliding gates in parallel. These gates would serve as the flow control structure for the ladder and screen and dissipate up to 1 foot of head between the creek and canal water surfaces. The second control structure is a gate at the top of the fish ladder. This gate would be adjusted to keep the screen and ladder within design standards until the creek discharge reaches the design flow. To account for the possibility that the head differential may vary by more than 2 feet over the range of design flows, a foundation would be laid immediately upstream of the existing sediment trap to accommodate an additional control structure if it is determined to be needed at a later date.

Construction of the fish screen would require the placement of a cofferdam within Inskip Canal just below the construction zone for the screen. The location of this cofferdam is along the alignment of the proposed permanent prefabricated bridge canal crossing. A construction access road would be maintained across this cofferdam during construction. Construction of this cofferdam would allow operation of the completed bypass tunnel and continued power generation at downstream powerhouses while construction of the fish screen and ladder proceeds.

To meet velocity requirements across the fish screen, the Inskip Canal cross section would require widening, and the capacity of Tunnel No. 1 would need to be increased. This existing tunnel has very little overburden cover over it, leading to concerns that any attempt to increase the diameter of the tunnel to provide additional capacity would lead to its collapse. Consequently, Tunnel No. 1 would be converted to an open-channel section to provide the additional capacity. The canal cross section would be realigned approximately 40 feet to accommodate the new section. This widened section would be tied into the existing canal cross section immediately downstream of the proposed ladder and screen.

Headworks

The existing headworks structure, located near the right bank just upstream of the tunnel entrance, would be removed and replaced with a new structure. The new concrete structure would be cast against the rock abutment on one side and anchored to the existing dam on the other side. The structure would be just over 31 feet long and 20 feet wide, with a rectangular flow area 16 feet wide. The headworks entrance would be protected by a trashrack and would house two electric gates mounted side by side. Headworks equipment would include electrical controls and monitoring systems to allow automatic operation of the gates, in coordination with other flow regulation equipment at the site.

Sluiceway

The existing sediment basin is located just upstream of the future fish screen and includes a radial gate structure. The radial gate would be repaired and a new sluiceway would be added downstream of the radial gate to convey water over the new fish ladder and into the creek. The sluiceway, a concrete channel 8 feet wide, 5 feet high, and about 60 feet long, would be constructed on fill and also supported by piers. Radial gate improvements at the sediment basin would consist of cleaning and coating radial gate steel surfaces and installing a new beam assembly above and just in front of the radial gate, to prevent fish from jumping over the gate. The sluiceway and radial gate would be used periodically to remove accumulated sediment. The improvements to the radial gate at Inskip Diversion Dam would be similar and would also include replacing damaged steel members.

Inskip Canal Wasteway

An overflow wasteway in the Inskip Canal would be provided in the area between the South Powerhouse tailrace connector tunnel outlet and the fish screen. The wasteway would consist of a 100-foot-long concrete overflow box and pipe set in the southwestern Inskip Canal embankment. Excess water in the canal would overflow a lowered weir section into a concrete box collector. This concrete collector box would feed the excess water into a pipeline that discharges into the South Fork. The wasteway structure would have a capacity of 105 cfs. This wasteway would protect Inskip Canal from an uncontrolled overtopping that could occur when an excessive amount of water is discharged into the canal from the combined flows of the South Powerhouse tailrace and the penstock bypass while supplemental diversions were being made at Inskip Diversion Dam through the fish screen. The Inskip Canal wasteway would ensure that any flows that exceed the capacity of Inskip Canal could be removed from the canal in a controlled manner. The discharged water would be a mixture of North and South Fork water but excess flows would be of short duration.

South Powerhouse Tailrace Connector Tunnel

The proposed tailrace connector tunnel would allow diversion of South Powerhouse tailrace flows to Inskip Canal. The connector tunnel consists of a new 1,200-foot-long excavated tunnel in the northern slope paralleling the South Fork. The tunnel inlet portal branches off of the existing tailrace channel about 300 feet downstream of the powerhouse and consists of a 50- to 100-foot-long open-channel section transitioning into the tunnel bore section. The tunnel portal cut would be about 34 feet high and 50 feet wide. The concrete headworks structure constructed at the inlet portal would incorporate an 8-foot-by-7-foot radial gate for operation and maintenance purposes. The inlet portal headworks would also incorporate stoplog slots to act as a backup to the radial gate.

The tailrace channel immediately upstream of the inlet portal to the tunnel would include a sediment trap basin. This basin consists of an excavated basin approximately 20 feet by 100 feet. This basin would be excavated into the channel with a gabion wall at the upstream end. This basin would be used to trap any rock and sediment entering the tailrace from the wasteway before it enters the proposed tunnel.

The tunnel outlet portal would discharge flows into the Inskip Canal at a point about 150 feet upstream of the inlet portal of Tunnel No. 2 on Inskip Canal. The outlet portal would consist of a transition into an open-channel unlined stilling basin section that would be about 120 feet long extending from the tunnel section to the connection with Inskip Canal. The open channel cut would be approximately 50 feet wide, and the total footprint of this open canal would be approximately 70 feet wide. The connector tunnel design discharge is 165 cfs. The proposed tunnel cross section is horseshoe-shaped with a height/diameter of 10 feet. The tunnel would be predominantly unlined, with the exception of some short sections that may require shotcrete lining.

South Powerhouse Tailrace Channel Modification

The South Powerhouse tailrace channel would be modified to prevent mixing of North Fork Battle Creek water with South Fork water. The proposed modification would continue to use the natural drainage channel wasteway to bypass waste flows past the powerhouse to the tailrace when the powerhouse or penstock is shut down. The tailrace would be closed off, however, and instead of being allowed to enter the South Fork Battle Creek, the water would be conveyed into the new connector tunnel (described above). The proposed South Powerhouse tailrace modification incorporates the modifications to the peninsula and existing tailrace channel that are necessary to divert flows into the proposed new bypass tunnel.

Proposed elements that are included in this feature include:

- construction of a tailrace dike and spillway,
- construction of a temporary tailrace construction cofferdam,
- construction of a permanent tailrace box culvert, and
- construction of a tailrace access ramp.

Tailrace Dike

A tailrace dike would be constructed along the left bank of the tailrace channel from the South Powerhouse discharge outlet to the tunnel inlet portal. The dike would be constructed to Elevation 1,460, which would prevent South Fork Battle Creek from overtopping the dike for flows up to the 100-year flood. A 50-foot-long portion of the dike would be constructed at Elevation 1,458. This portion of the dike would function as a spillway, which would allow the controlled discharge of overtopping tailrace flows into South Fork Battle Creek. The dike

would be protected with riprap on the creek side to prevent erosive forces from undercutting the dike foundation. The top of the tailrace dike would be used as the access road to the Inskip Diversion Dam fish screen and ladder facilities.

Temporary Tailrace Construction Cofferdam

A temporary cofferdam would be constructed upstream of the proposed bypass tunnel inlet portal in the tailrace to prevent tailrace water from entering the tunnel while the tunnel is being constructed. The 13-foot-high cofferdam would be approximately 70 feet long at its top elevation and 60 feet wide at its base and would be constructed from approximately 2,000 cubic yards of suitable on-site materials and a geomembrane. The upstream face of this temporary cofferdam would be treated with riprap for slope protection.

Permanent Tailrace Pipe Culvert

A permanent 170-foot-long, gated box culvert would be constructed through the northern section of the tailrace peninsula. This box culvert is to extend from upstream of the location of the temporary construction cofferdam to a point downstream of the tailrace dike. Both the upstream and downstream ends of this culvert would incorporate an entrance and exit concrete structure with riprap slope protection. This culvert would be equipped with slide gate/stoplog system to provide on/off flow control. If future powerhouse releases must be diverted from the connector tunnel or Inskip Canal for repair and/or inspection purposes, the box culvert gate could be opened and the connector tunnel inlet portal gate could be closed. This would allow continued operation of South Powerhouse by temporarily routing tailrace flows to the South Fork of Battle Creek through the culvert. Such operation would result in temporary mixing of North and South Fork water.

Operation and Maintenance Tailrace Access Ramp

A permanent 10-foot-wide earth ramp into the tailrace channel would be provided to allow equipment access to the sediment basin that would be located upstream of the approach to the bypass tunnel inlet portal. This permanent access ramp would extend off of the permanent dike to be constructed at the downstream end of the tailrace channel.

Access Road Improvements

Two types of access improvements would be required to implement the project elements. An access point on top of the plateau (near South Powerhouse) that avoids the residential area would be required for construction. Access improvements also would be required in the vicinity of the South Powerhouse and Inskip Diversion Dam . The road that provides access down the slope to the powerhouse from the top of the plateau is considered sufficient for construction and long-term operation and maintenance purposes.

To avoid the residential area on top of the plateau, a new road is proposed that restores and improves an old ranch road that is located approximately 1,500 feet east of the residential area. This road would provide construction access from

Hazen Road, where improvements to the intersection would be required to meet all county standards for temporary construction road intersections. This road would be 20 feet wide and would follow along the old road alignment, which is in a degraded condition. This road would be smoothed and paved with 3 inches of suitable road gravel. A construction zone 50 feet wide would be required to build this road. Brush along this road would be cleared to reduce fire hazard. This improved access road on top of the plateau would intersect the existing South Powerhouse Access Road at the point beyond the residence.

Permanent vehicle access would be required to construct, operate, and maintain the proposed Inskip Diversion Dam fish screen and ladder and new tunnel outlet portal facilities. The new road would begin at the South Powerhouse and use the tailrace dike to cross the tailrace area. The road would then travel overland from a point near the tunnel inlet portal toward Inskip Diversion Dam fish screen and ladder facilities on the north side of South Battle Creek. The proposed road alignment is shown in Figure 2-5.

After crossing the tailrace channel via the tailrace dike, the 1,850-foot-long road would rise above the riparian vegetation zone and existing foot trail and then roughly parallel the slope to the vicinity of Inskip Diversion Dam. Construction of this section of the access road would require a 20-foot-wide cut, with the upslope side of the road cut at a slope of 1½:1. The maximum cut occurring in the slope is 31 feet high. As the road approaches Inskip Diversion Dam, the road begins dropping to the level of the fish screen and ladder, where a large, flat staging/parking area would be developed. This staging/parking area would be roughly 60 feet by 70 feet in size. This sloped area would be cleared and flattened to provide both construction access and long-term operation and maintenance staging. An additional spur road would be developed off the staging/parking area that parallels Inskip Canal along its upslope side to the bypass tunnel outlet portal and its associated stilling basin.

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

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

Waste and Borrow Areas

Waste disposal areas would be required to accommodate approximately 25,000 cubic yards of material from the proposed tunnel excavation and access road construction. This material would be used to improve the road on top of the plateau that leads to the South Powerhouse header box. A 2,400-foot length of this road could be improved by placing and compacting the materials on top of the road. This road could be raised about 2 feet using this method of disposal. The remaining waste material would be spread over an area up to 300 feet wide by 400 feet long. The waste material would be piled as high as is practical, in accordance with the landowner's requirements, to minimize the amount of area permanently disturbed. The local landowner or PG&E could use this material for future road maintenance and improvements. Small quantities of waste material may also be used, as needed, for the fish ladder construction and for filling in nearby sections of South Canal.

To the extent possible, excavated materials would be reused to construct various project features. There are no borrow areas identified on the project lands. If special materials were needed that cannot be obtained from the excavations, those materials would be imported from off site.

Construction Considerations

Construction activities potentially would affect the following areas near the South Powerhouse:

- **Intersection modifications to the Old Ranch Road at Hazen Road and Manton School Road.** Selected clearing and grading would disturb approximately 5,500 square feet. An additional 2,500 square feet would be completely cleared, graded, and paved. Work would involve clearing vegetation, compacting the ground, placing and compacting aggregate road base material, placing asphalt pavement, realigning the fence, and adding a gate and cattleguard. Electrical power may be brought to the site to operate a new automatic gate and notification system. If an electric-powered system were installed, the overhead power lines located 650 feet north of Hazen Road (east side) would be extended to the new entrance.
- **Improvements to an existing deteriorated dirt road to accommodate construction traffic**. These improvements would include:
  - A 4,100-foot-long, 50-foot-wide corridor would be cleared of vegetation to reduce fire hazard. The total area cleared would be approximately 205,000 square feet.
  - A 20-foot-wide traveled way would receive 3 inches of aggregate base material. The total area to be graveled would be approximately 80,000 square feet. Minor grading and compacting would be performed.

- A 12-inch-diameter, 25-foot-long corrugated metal pipe (CMP) culvert would be installed at a swale in the topography near the spring area located 2,000 feet south of Hazen Road.
- Two gates would be widened and possibly relocated within the 50-foot corridor.

- **South Powerhouse Access Road.** Maintenance during construction of the existing PG&E access road to the South Powerhouse, from its junction with the temporarily improved Old Ranch Road down to the powerhouse, would consist of grading and adding gravel surfacing and possibly chip seal or asphalt paving over certain portions. Vehicle travel would be restricted to this road, which would not be widened. The 3,800-foot section of the South Powerhouse access road from Hazen Road to the junction with Old Ranch Road would not be affected.
- **Area A.** The gently sloped portion of this area would be used by the contractor or government for staging, temporary stockpiling, or other temporary uses. The total area affected would be approximately 68,000 square feet.
- **Contractor use area.** This area would be located adjacent to the existing access road. The total area affected would be approximately 60 feet by 200 feet, or 12,000 square feet.
- **Peninsula area**. This area, adjacent to the powerhouse, would be heavily disturbed by construction activities for the following new features: an access road, a tailrace dike, creek-side riprap armoring, temporary small cofferdams in the creek and tailrace, an access ramp into the tailrace, large-diameter culverts through the peninsula, and associated riprap downstream of the culverts and tailrace dike. The area would extend to 20 feet south of the south bank of Battle Creek and to the uphill-side waterline (north side) of the tailrace. The total area affected would be approximately 122,000 square feet.
- **Low-water crossing area.** This crossing area, which allows access to the left (south) side of Inskip Diversion Dam, may be widened and vegetation cleared to a 20-foot-wide corridor for a distance of approximately 250 feet. The existing crossing has a concrete apron within the flow channel and is suitable for the lower flows normally encountered. Because of the required cessation of flows in the South Canal, the flows in Battle Creek would be increased. Temporary culverts may be installed to improve safety and increase the duration of use of this crossing area. The crossing is necessary to establish access to the right side of Inskip Diversion Dam in order to construct the fish ladder exit (headworks modifications). The total area affected would be approximately 5,000 square feet.
- **Area encompassing the terrain affected by construction of the new access road.** This area would extend from the tailrace to the parking area adjacent to the fish passage facilities. It also would include the tunnel inlet portal area but would not include the parking area or downstream portal area. The total area affected would be approximately 99,000 square feet.

- **Area encompassing the new tunnel downstream portal area, construction access ramp, and other features associated with the new tunnel from the Tunnel No. 2 inlet to the existing footbridge and from the left edge of the canal bank (looking downstream) upslope to the limits of the access road**. The total area affected would be approximately 24,000 square feet.
- **Area extending from the preceding 24,000-square-foot area downhill to the middle of Battle Creek.** Features to be constructed in this area would include the wasteway inlet structure, its outfall pipe, and the levee bank reinforcement between the fish screen and the Tunnel No. 2 inlet. The total area affected would be approximately 37,000 square feet.
- **Area encompassing the fish facilities downstream of Inskip Diversion Dam to the two preceding areas (24,000 square feet and 37,000 square feet) and extending 20 feet south of the south bank of the creek.** This area would include the fish ladder, fish screen, associated access roads, ramps, bridges, and parking areas and would extend to within 70 feet downstream of the dam. The existing fish ladder, which encompasses approximately 700 square feet of this area, would be partly demolished (metalwork removed and disposed of) and plugged. Much of the area not permanently occupied by the new features would be used by the contractor for staging, stockpiling, and other temporary uses. This area would be required to allow the construction workers and equipment access to the new and existing fish ladder work sites. The total area affected would be approximately 137,000 square feet.
- **Area encompassing the temporary access road on the south side of Battle Creek.** This area would encompass the diversion works that would be built to allow construction of the headworks modifications on the right abutment of Inskip Diversion Dam (for the fish ladder exit). A 20-foot-wide path would be cleared and graded from the low-water crossing described above, downstream to the vicinity of the dam. The diversion works would consist of an earthen cofferdam enclosing the headworks area, an access road embankment from the left side of the creek to the cofferdam, culverts under this access road to pass the creek flow through, riprap armoring to protect the temporary embankments from creek erosion effects, and excavation within the creek to channel the diverted creek flow toward Inskip Diversion Dam. The diversion works activities within the creek would extend about 200 feet upstream of the dam. All of these features would be removed at the completion of the headworks modifications and the areas restored to their preconstruction condition. The total area affected would be approximately 46,000 square feet.
- **2,400 feet of existing access road connecting the road along the top of the plateau to Lower Ripley Creek Feeder Diversion Dam** (both discussed under the Lower Ripley Creek Area below). The road may be raised up to 2 feet with excess excavated material. The total area affected would be approximately 36,000 square feet.

- **Disposal area**. This area adjoins the access road described above. It would be used for excess excavated materials. The total area affected would be approximately 132,000 square feet.
- **Staging area for contractor and government use.** This area also adjoins the access road. The total area affected would be approximately 320,000 square feet.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, repaired, or repaved if necessary. Staging and disposal areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

Construction activities at the Inskip Diversion Dam/South Powerhouse site would require extensive coordination. The sequence of construction at this site would roughly follow this order:

- prepare upper plateau access road;
- construct peninsula culvert and tailrace dike;
- construct lower site access road after crossing peninsula and tailrace dike;
- install temporary tailrace cofferdam;
- construct a temporary cofferdam within Inskip Canal upstream of the bypass tunnel outlet portal, and install a fish screen and ladder; and
- complete site restoration.

Construction at this site would occur over a 21-month period, with one winter shutdown lasting approximately 7 months. Construction is anticipated to begin in June 2006 and end by February 2008.

Water diversions into Cross Country and South Canals that supply water to South Powerhouse would be interrupted to allow construction to be performed. Water diversions into Inskip Canal would also be interrupted for periods. In addition, South Powerhouse would be shut down to allow construction to be performed.

Lower Ripley Creek Feeder

Project Elements

Proposed actions at the Lower Ripley Creek Feeder site include:

- removal of Lower Ripley Creek Feeder Diversion Dam;
- removal of appurtenant facilities, including the feeder canal; and
- improving access roads.

The proposed construction area for the Lower Ripley Creek Feeder site is presented on Figure 5 in Appendix G.

Lower Ripley Creek Feeder Diversion Dam

For the Restoration Project, Lower Ripley Creek Feeder Diversion Dam would be removed. The dam consists of a 17-inch-thick concrete wall with a maximum structural height of about 5 feet and a crest length of 44 feet. An 8-foot-wide overflow section with wooden flashboards provides for releases to Ripley Creek. Diversion releases are made through a 22-by-35-inch wooden slide gate near the left abutment. The diversion dam is a very small structure and could be removed easily using an excavator with a hoe-ram or similar construction equipment. All waste concrete would be removed from the site. Cold spring water entering Ripley Creek above the dam would be allowed to continue downstream of the dam site.

Appurtenant Facilities

The diversion canal extends 384 feet downstream from the dam to the Inskip Canal. The canal would be filled in using the existing canal bank materials. The existing canal bank would be excavated to a depth that fills in the canal and reestablishes the original ground slope as near as possible. The area would be graded to prevent ponding and allow cross-slope drainage to continue downslope. The bank excavation would be adjusted locally to minimize affecting the root zones of adjacent trees. Where the feeder canal discharges into Inskip Canal, the transition would be shaped and armored with riprap to ensure stability of the canal. The concrete measuring flume located in the canal just downstream of the dam would be removed and disposed of off site. All waste steel, mechanical, and miscellaneous items would be removed and disposed of off site.

Access Road Improvements

Lower Ripley Creek Feeder Diversion Dam is accessed from the east or west over primitive roads. Grading and graveling would be performed as needed to facilitate construction.

Construction Considerations

Construction activities potentially would affect the following areas near Lower Ripley Creek:

- **Road along the top of the plateau.** The road would be graded to reduce its roughness (ruts, potholes, etc.). Vehicle travel would be restricted to this road, which would not be widened. The distance from the South Powerhouse Access Road to Lower Ripley Creek Feeder Diversion Dam is 16,300 feet. This 15-foot-wide road continues to the west of Lower Ripley Creek Feeder for 9,400 feet to the headworks for Inskip Powerhouse at the confluence of Eagle Canyon Canal and Inskip Canal.
- **Lower Ripley Creek.** Water from the Cross Country Canal would be diverted into Lower Ripley Creek to bypass water around the South Powerhouse construction zone. This reach of Lower Ripley Creek would convey uncharacteristic, but not unprecedented, high flows (50 cfs versus 3 cfs) for up to several months. The flows diverted from the Cross Country Canal would be diverted at Lower Ripley Creek Feeder Diversion Dam to the Inskip Canal via the present Feeder Canal (modified as described below). The length of affected creek channel from the Cross Country Canal to Lower Ripley Creek Feeder Diversion Dam would be approximately 16,100 feet. The distance from Lower Ripley Creek Feeder Diversion Dam to South Fork Battle Creek is 4,500 feet. The total length of Lower Ripley Creek that would be affected is 20,600 feet.
- **Lower Ripley Creek Feeder Diversion Dam.** Removal of Lower Ripley Creek Feeder Diversion Dam would affect a 6,000-square-foot area. Prior to the period of diverted flows described above, the Feeder Canal would be widened and deepened and its banks raised so that it could safely accommodate these higher, temporary flows. The final removal of the Feeder Canal would affect a total area of approximately 14,000 square feet.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, and repaired or repaved if necessary. Staging areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as

appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

Construction at Lower Ripley Creek Feeder Diversion Dam would involve diverting flow back into Ripley Creek followed by removing the dam and backfilling the diversion channel. Construction at this site would occur over a period of 2 weeks for the temporary canal diversion and an additional 2 weeks for the final removals. Construction is anticipated to occur during July 2006.

Coleman Diversion Dam/Inskip Powerhouse

Project Elements

Proposed actions at Coleman Diversion Dam/Inskip Powerhouse site include:

- constructing Inskip Powerhouse bypass facility,
- constructing Inskip Powerhouse tailrace connector, and
- removing Coleman Diversion Dam and appurtenant facilities.

The features proposed for Coleman Diversion Dam/Inskip Powerhouse for the Restoration Project are shown on Figure 2-6. The proposed construction area for the Coleman Diversion Dam/Inskip Powerhouse site is presented on Figure 4 in Appendix G.

Inskip Powerhouse Bypass Facility

A new overflow wasteway on Eagle Canyon Canal would be constructed about 40 feet upstream of the Inskip Canal confluence to the penstock forebay inlet. The proposed wasteway consists of a new side channel spillway constructed in the existing Eagle Canyon Canal berm that would allow water to spill out of the canal in a controlled manner when the penstock or Inskip Powerhouse facilities are shut down. The overflow spillway consists of a concrete box 115 feet long by 6 feet wide that directs canal flows to an 84-inch concrete pipe. The overflow spillway would include a trash rack to collect any debris, and a safety guardrail. The 84-inch collector pipe would be buried to grade and extend approximately 150 feet downslope where it transitions to a 66-inch-diameter reinforced concrete pipe. The existing Inskip Canal wasteway located on the Inskip Canal approximately 500 feet upstream of the penstock forebay inlet would be raised by a new flashboard structure, preventing any canal water from entering South Fork Battle Creek via the existing drainage channel.

The primary conveyance feature provided to bypass powerhouse flows would involve constructing a 5,662-foot-long, 340-cfs bypass pipeline/chute that consists of sections of pre-cast reinforced concrete pipeline and open-channel rectangular chute. This bypass facility would have three sections: (1) the upland pipeline section; (2) the downslope chute section; and (3) the Coleman Canal connector section.

The upland section would extend from the end of the 84-inch overflow spillway concrete pipe about 3,600 feet along the top of the plateau to a point overlooking Coleman Diversion Dam. This upper plateau pipeline section consists of 66-inch-diameter reinforced concrete pipe. This section terminates into an upper jump basin constructed at the top of the plateau at the point where the bypass facility is directed down the slope to the floodplain terrace at creek level. This pipe would be completely buried with a minimum of 2 feet of cover over the top of the pipe. This pipe section would transition into a 50-foot-long-by-14-foot-wide upper jump basin energy dissipater. The purpose of this energy dissipater is to reduce the energy generated by the water falling about 160 feet in elevation as it traverses the upper plateau. The upper jump basin stilling pool would exit into the second section of the bypass facility, the downslope chute section. The upper jump basin area would be enclosed by chain link fence to prevent people or animals from entering the area. From the top of the plateau at the upper jump basin, the water would be conveyed to a second jump basin, located at the base of a drop, approximately 210 feet, from the plateau. The 340 cfs of water would be conveyed to the second jump basin via a 550-foot-long open-channel rectangular-shaped concrete chute. This chute is about 6 feet high, 5 feet of which would be embedded into the ground (about 1 foot of the side walls of the rectangular chute would extend aboveground). The second jump basin at the bottom of the hill would be approximately 54 feet long, 15 feet wide, and 19 feet deep. The chute would cross an existing water supply line about 200 feet downstream of the upper jump basin. The water supply line would be rerouted through a new steel pipe section that would cross above the chute. Water deliveries would not be interrupted during the installation of the replacement section. The chute and lower jump basin area would be enclosed by chain link fence to prevent people or animals from entering the chute. Crossings would be built at locations along the chute to allow animals access to both sides of the structure. The feasibility of providing animal crossings for the portion of the existing penstock that descends the hillside will be investigated to enhance the benefits resulting from providing the chute animal crossings.

From the second jump basin, the bypass facility would convey water to Coleman Canal with a 263-foot-long, 66-inch reinforced concrete buried pipe to a baffled outlet structure. The outlet structure would discharge into a new entrance channel that directs the flow from both the bypass facility and the Inskip Powerhouse tailrace connector into the canal. This open entrance channel section is about 60 feet wide at its widest point and transitions down to about 10 feet wide at the existing Coleman Canal trash rack and gate control facility. The depth of the open channel would vary from about 10 to 16 feet deep. A 10-foot-wide access ramp would be provided into the channel to allow maintenance of the entrance channel.

The bridge that crosses Eagle Canyon Canal to allow access to the forebay inlet and penstock header box area would be removed. The existing road would be relocated, and the Eagle Canyon Canal crossing would be replaced with a steel arch culvert. A 12-foot-wide graveled access road would be constructed from the new overflow spillway along the bypass pipeline to the upper jump basin. Drainage flows from the header box sluicing operations would be conveyed over the bypass pipeline in armored channels and under the access road in culverts. A spoilbank would be placed along the pipeline corridor. The spoilbank materials are excess materials from the structure excavations. From the upper jump basin, a temporary graveled access road would extend north to Manton Road. An intersection would be developed at this location about 0.2 mile east of the Coleman Dam access road and would serve as the primary point of entry to the plateau site for construction activities.

Inskip Powerhouse Tailrace Connector

The Inskip Powerhouse tailrace would be reconstructed to prevent powerhouse discharges from entering directly into the South Fork Battle Creek. The existing tailrace contains a 31-foot-long, 10-foot-wide, curved concrete outlet with vertical walls. The outlet floor slopes upward 4.5 feet from the turbine draft tube sump to the creek bottom. The proposed tailrace reconstruction includes:

- installing a bolted-on slide gate or bulkhead at the end of the existing tailrace walls to close off the tailrace from the creek;
- constructing a gate structure through the right tailrace wall that would convey the discharge from the powerhouse to an 84-inch pipeline leading to the Coleman Canal; and
- constructing an outlet transition to discharge water from the 84-inch pipeline into the Coleman Canal.

The channel and gate structure would facilitate continuation of power generation during construction of the tailrace connector pipeline. The 660-foot-long, 84-inch tailrace connector pipeline would be buried, terminating at an outlet transition structure equipped with a slide gate or bulkhead for operation and maintenance purposes. The outlet transition structure would discharge the tailrace flow into the new Coleman Canal entrance channel.

Coleman Diversion Dam and Appurtenant Facility Removal

For the Restoration Project, the masonry dam overflow section with concrete overlay would be removed. The dam construction incorporates rock cobbles embedded in a mortar matrix and would be removed from the site to the extent that it will not affect conditions supporting upstream migration of juvenile and adult steelhead and Chinook salmon at minimum flow releases from upstream

dams and will not adversely modify spawning (e.g., armoring) or rearing habitat. A qualified fish biologist will inspect the stream channel and confirm the restoration of habitat conditions.

The following appurtenant structures would also be removed:

- radial sluice gate structure,
- Alaska Steeppass fish ladder and concrete,
- reinforcing steel and miscellaneous metalwork, and
- original concrete fish ladder structure.

The rock masonry wall that forms the left embankment of the Coleman Canal would be retained, including the weir wall that extends approximately 30 feet upstream from the dam parallel to the creek flow. The curved wing wall that extends from the metal grating footbridge out toward the creek also would be retained. The masonry wing wall that extends from the curved wall would be partially removed to allow construction of the newly configured entrance channel to the canal. The area that lies behind the weir wall that extends upstream from the dam and parallels the creek flow would be backfilled and riprapped.

Sediment Management

Sediment behind the existing dam would be left in place to be distributed by floodflows. A pilot channel would be excavated to approximately 500 feet upstream of the dam site to facilitate mobilization of sediments in the stream channel and fish passage. The pilot channel would have a bottom width of 8 feet and side slopes of 3:1. The bottom slope of the pilot channel would be approximately 0.024. Material excavated for the pilot channel would be spread in the river channel upstream of the dam. Under low flow conditions, the pilot channel geometry would provide a sufficient depth of water so as not to pose a barrier to fish passage. Under typical winter flow conditions, sediments would quickly begin to erode and distribute downstream.

Construction Considerations

Construction activities potentially would affect the following areas near the Inskip Powerhouse:

- **Existing paved access road off of Manton Road to Inskip Powerhouse.** This road would be used heavily during construction. The road would not be widened or otherwise modified for construction. The traveled surface may be repaved (2,200 feet by 15 feet) at the end of construction. The total area affected would be approximately 33,000 square feet.

- **Dirt access road off Manton Road that follows the Eagle Canyon Canal to the Inskip Powerhouse Penstock header box.** This 3,600-foot-long-by-20-foot-wide road may be bladed and graveled to allow all-weather access by light vehicles only. Heavy construction equipment would not use this access route. The traveled surface would be restored at the end of construction. The total area affected would be approximately 72,000 square feet.
- **Primitive dirt road off Manton Road located 1,000 feet northeast of the entrance of the paved access road off Manton Road to the Inskip Powerhouse.** This road would be improved to allow all-weather access for heavy construction equipment. The intersection area would be widened to create a paved turnoff lane and a paved apron setback off Manton Road (400 feet by 150 feet). The existing 10-foot-wide path would be widened to 20 feet and graveled for a 900-foot length to the point where it joins the planned 85-foot-wide corridor of the new penstock bypass. A staging area (about 1 acre) would be established near the upper jump basin. The total area affected would be approximately 144,000 square feet.
- **Vicinity of inlet structure for penstock bypass.** Construction would include rerouting the access road, an Eagle Canyon Canal temporary bypass, the inlet structure, and adjacent staging areas. The total area affected area would be approximately 138,000 square feet.
- **Shotcreted overflow structure on the Inskip Canal.** This structure, which serves as the penstock bypass, would be modified to incorporate a flashboard-type structure. Construction would include a 12-foot-wide access road crossing the existing penstock headworks structure. The total area affected would be approximately 33,000 square feet.
- **3,600 feet of the Inskip Powerhouse penstock bypass pipeline.** The portion of the pipeline crossing the plateau area between the inlet structure at the Eagle Canyon Canal and the upper jump basin would be replaced with a new pipeline and chute system. The work corridor is 85 feet wide; the total area affected would be approximately 309,000 square feet.
- **Area south of the penstock bypass pipeline.** Outflows from the header box would be rerouted and channelized to cross the new pipeline. Work would include constructing deflector berms with stone armoring, filling abandoned channels, and installing culverts. The total area affected would be approximately 88,000 square feet.
- **Chute portion of penstock bypass.** The chute portion corridor would be widened from 85 feet to 120 feet in order to conduct special work to cross the water supply line. The total area affected would be approximately 77,000 square feet.
- **Area between the powerhouse and new chute area.** This area would be used as staging areas and a disposal site for excess excavated materials. Total area affected would be approximately 78,000 square feet.
- **Closure wall.** The area that would be disturbed to construct the tailrace connector pipeline in the vicinity of the creek would be minimized to protect the riparian corridor and the upland area to protect trees. Some work within

the creek in the vicinity of the powerhouse tailrace outlet area would be necessary to construct the closure wall and riprap slope protection. Total area affected would be approximately 141,000 square feet.

- **The area upstream of Coleman Diversion Dam below the high-water mark.** This area would be affected by the excavation and redistribution of the sediments that are presently impounded. A pilot channel would be excavated and portions of the materials placed in spoilbanks within the creek channel and left to be distributed by the natural flows. Total area affected would be approximately 69,000 square feet.

All areas temporarily disturbed by construction would be restored to their preproject conditions. Existing roads would be regraded, graveled, and repaired or repaved if necessary. Staging areas would be shaped and graded to prevent ponding of water, planted with suitable grasses and other vegetation, and protected with other erosion control measures if necessary to prevent turbid runoff from escaping the site. Areas within the creek channel would be shaped and regraded to eliminate any obstacles to the creek flow or fish passage. Areas permanently disturbed by construction generally do not require restoration. However, permanent cutslopes would be shaped, graded, and vegetated as appropriate to ensure that the slopes remain stable and do not allow turbid runoff to escape the area.

Construction Sequencing and Schedule

The sequence of construction at Coleman Diversion Dam/Inskip Powerhouse would roughly follow this order:

- construct Eagle Canyon Canal plugs and temporary bypass channel;
- construct Eagle Canyon Canal wasteway overflow spillway;
- construct upper plateau reinforced concrete pipeline and upper jump basin energy dissipater;
- construct slope reinforced concrete rectangular chute with lower jump basin energy dissipater;
- construct entrance channel to the Coleman Canal and lower jump basin exit pipe, baffled outlet structure, and tailrace connector pipe and outlet structure;
- construct cofferdam in South Fork Battle Creek (if required);
- close existing diversion channel to the Coleman Canal;
- concurrently plug old Inskip Canal wasteway and remove remaining plug of new entrance channel; and
- remove Eagle Canyon Canal plugs and remove Eagle Canal temporary bypass channel.

Construction for the project is expected to last 39 months and is anticipated to begin May 2005 and end in July 2008.

Water diversions into Eagle Canyon and Inskip Canals that supply water to Inskip Powerhouse would be interrupted to allow construction to be performed. Water diversions into Coleman Canal would also be interrupted for periods. Also Inskip Powerhouse would be shutdown to allow construction to be performed. Two brief powerhouse outages would be taken during the first construction season followed by a brief powerhouse outage in the second construction season.

Asbury Pump Diversion Dam

Asbury Diversion Dam is located on Baldwin Creek approximately 0.7 mile above its confluence with Battle Creek. Baldwin Creek has been identified as one of several tributaries to Battle Creek capable of providing suitable habitat for steelhead and other aquatic organisms. Releasing water at Asbury Diversion Dam would allow the cold water from Darrah Springs to enter the mainstem of Battle Creek and help improve the summer holding conditions in that reach of the stream for the target species.

Project Elements

For the Restoration Project, proposed restoration actions in Baldwin Creek include an instream flow release of up to 5 cfs from Asbury Pump Diversion Dam. Cold spring water entering Baldwin Creek from Darrah Springs above the dam would be allowed to continue downstream of the dam site. PG&E would be required to operate a remote sensing device to continuously measure and record total flow and stage fluctuations immediately below the diversion dam during all operations to verify compliance with applicable provisions under the FERC license.

The instream releases would be accomplished by raising an existing 30-inch-wide vertical slide gate located on the dam. Asbury Diversion Dam creates an impoundment approximately 3 feet high. Under current operating conditions, the gate is periodically opened completely to allow sluicing of the sediments that accumulate behind the dam. Under future conditions, the gate sluicing operation would continue. Also, to accomplish the required instream releases the gate would be partly open (a few inches) on a regular basis.

A new stream gage station would be installed within 200 feet downstream of the dam. A bubble gage system would be installed rather than a weir. The bubble gage system senses water depth that is calibrated to the flow in the creek by a rated stage-discharge curve. The station would consist of a 1-inch-diameter pipe with one end submerged in the creek channel at a point where the streambed is stable and an accurate field measurement of creek flow can be obtained. The

pipe would extend from the creek up the bank to a weatherproof, secure enclosure such as a locked, vertical-oriented 4-foot-diameter CMP. The enclosure would house the recording and telemetry equipment. Several such systems are in use on the Hydropower Project. A set of stairs would be constructed along the pipe from the enclosure down to the creek to allow maintenance. A staff gage would be installed in the creek to allow confirmation of the bubble gage system. A walking trail would be developed between the diversion dam and the enclosure.

Construction Considerations and Sequencing

Construction activities potentially would affect the following areas near Asbury Diversion Dam:

- **Gage Station.** Construction of the gage station would involve no earthwork within the creek channel. Construction of the stairs leading down the creek bank would require a limited amount of clearing of vegetation and minor hand excavation (300 square feet). Construction of the enclosure at the top of the bank would involve clearing of vegetation, minor hand excavation, and constructing a concrete pad (100 square feet). Total area affected would be approximately 400 square feet.
- **Access trail.** The access trail between the diversion dam and the enclosure would involve clearing vegetation and minor hand excavation. Total area affected would be approximately 1,200 square feet.

Adaptive Management Plan

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 on best scientific and commercial information available.

The primary reason for using an adaptive management process is to allow changes to restoration strategies or actions that may be needed to achieve the long-term goals and/or biological objectives and to ensure the likelihood of the survival and recovery of naturally spawning Chinook salmon and steelhead. Under adaptive management, restoration activities would be monitored and analyzed to determine whether they are producing the desired results (i.e., properly functioning habitats).

As implementation proceeds, results would be monitored and assessed. If the anticipated goals and objectives are not being achieved, adjustments in the restoration strategy or actions would be considered through the draft *Battle Creek Salmon and Steelhead Restoration Project Adaptive Management Plan* (Adaptive

Management Plan) (Appendix C), which has been developed consistent with relevant CALFED guidelines (Chapter 3 in CALFED Bay-Delta Program 1999) and the MOU (Appendix A). The Water Acquisition Fund and Adaptive Management Fund, which are elements of adaptive management, would provide funding for potential changes to Restoration Project actions that result from the application of the Adaptive Management Plan.

Currently, the draft Adaptive Management Plan is being revised by the Battle Creek Adaptive Management Team in response to comments received from the CALFED Technical Review Panel, which had reviewed Reclamation's proposal for additional funding presented February 2003. The draft Adaptive Management Plan is presented in Appendix C of this report. This draft report will be replaced with a final report once the final Adaptive Management Plan has been completed.

Facility Monitoring Plan

A detailed facility monitoring plan, prepared by PG&E in consultation with the other parties to the MOU, will be submitted to FERC as part of the license amendment application for the Restoration Project; the draft plan may be found in Appendix B. The draft monitoring plan delineates a program related to the Restoration Project's components that expands on typical FERC license monitoring requirements. PG&E would perform and assume the costs for the following facility monitoring:

- Verifying compliance with the FERC license at the various outlet and spillway works for North Battle Creek Feeder, Eagle Canyon, Inskip, and Asbury (Baldwin Creek) Diversion Dams by operating properly calibrated remote sensing devices that continuously measure and record total flow and the fluctuation of stage immediately below each dam during all operations.
- Identifying debris problems at the fish ladders at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams by operating properly calibrated remote sensing devices that continuously monitor water surface elevations at the tops and bottoms of the ladders.
- Identifying instances of plugging at the fish screens at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams by operating properly calibrated remote sensing devices that continuously monitor water surface elevation differences on the inlet and outlet sides of the screens. If the monitoring reports a critical malfunction on the screen, the failsafe feature would shut down the inlet to the canal until the situation has been remedied.
- Recording operation of waste gates, overpours, and spillways during dewatering of the conveyance for maintenance or to release excess water during emergencies.

PG&E will perform all the necessary maintenance and replacement on the fish screens, fish ladders, and stream gages as indicated by the monitoring, once Reclamation has released these structures for operation.

Water Rights

PG&E's water diversion rights associated with all dams removed in the Restoration Project would be transferred to DFG. For example, when the rights for the Soap Creek diversion are transferred, all rights and obligations associated with that diversion would be transferred, including, but not limited to, PG&E's Bluff Springs rights and obligations, 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 would execute the necessary documents to transfer these water diversion rights when it receives the associated portions of the funding specified in the MOU. DFG agrees that the transferred water rights would not be used to increase prescribed instream flow releases above the amounts specified in the MOU or developed pursuant to the Adaptive Management Plan. It further agrees that the rights would not be used adversely against remaining Hydroelectric Project upstream or downstream diversions until the FERC license is abandoned, at which time the limitation regarding transferred water rights would no longer apply.

For the Restoration Project, PG&E agrees that it will not use its riparian rights tied to lands associated with components of the Restoration Project to decrease prescribed instream flow releases below the amounts specified by the Restoration Project or developed pursuant to the Adaptive Management Plan. PG&E agrees that any deed transferring such riparian land or rights will contain this restriction.

PG&E and DFG would jointly file a petition with the SWRCB pursuant to Section 1707 of the California Water Code to dedicate to instream uses the water diversion rights associated with all removed dams in the Restoration Project.

Water Acquisition Fund

An important component of the Restoration Project is the Water Acquisition Fund. Its purpose is to establish a ready source of money that may be needed for any future purchases of additional instream flow releases in Battle Creek. These releases may be recommended under the Adaptive Management Plan during the 10-year period following the initiation of prescribed instream flow releases. The fund shall be used solely to purchase additional environmentally beneficial instream flow releases.

The Water Acquisition Fund account is funded with CALFED–approved federal funds ($3 million) administered by Reclamation for instream flow releases pursuant to the protocols developed by the resource agencies, following consultation with appropriate interested parties.

Protocols would be developed by the adaptive management technical team to identify environmentally beneficial flow changes for anadromous fish under the Adaptive Management Plan. If the adaptive management technical team or the adaptive management policy team cannot reach a consensus regarding flow changes, the resource agencies (collectively) and PG&E would each choose a person, and together those two persons would choose a single third party to act as mediator. If consensus still were not achieved through mediation, the resource agencies and PG&E would reserve their rights to petition FERC to resolve the subject action. The resource agencies and PG&E would assume their respective costs for any FERC process.

Biological and Environmental Monitoring Fund

In the 1999 MOU, Reclamation, NOAA Fisheries, USFWS, DFG, and PG&E agreed that USFWS and/or DFG, or their designated representatives, will perform biological and environmental monitoring in the Battle Creek watershed and Restoration Project area to address the overall status of anadromous fish populations and related ecosystem health. This monitoring will be performed 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, CALFED's Comprehensive Monitoring Assessment Research Program, and CVPIA's Comprehensive Assessment and Monitoring Program. Reclamation, NOAA Fisheries, USFWS, DFG, and PG&E understand and agree that if sufficient funding is not available through the above sources, they will jointly pursue other appropriate funding sources.

Adaptive Management Fund

The Adaptive Management Fund would implement actions developed under the Adaptive Management Plan. The purpose of the Adaptive Management Fund is to provide a readily available source of money to be used for possible future changes in the Restoration Project. The fund shall be used only for Restoration Project purposes directly associated with the Hydroelectric Project, including compensation for prescribed instream flow release increases after the Water Acquisition Fund has been exhausted or terminated. The Adaptive Management Fund shall not be used to fund monitoring or construction cost overruns.

The Adaptive Management Fund, in the amount of $3 million, will be made available to PG&E and the resource agencies by a third-party donor to fund those actions developed pursuant to the Adaptive Management Plan. The third-party donor shall deposit that amount in an interest-bearing account pursuant to a separate agreement to be developed jointly by the resource agencies, PG&E, and the third-party donor. These three parties jointly will develop account disbursement instructions.

The three parties agree that (1) interest on the funds in the Adaptive Management Fund 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 Adaptive Management Fund will revert to the third-party donor at the end of the current term of the license for the Hydroelectric Project. USFWS shall request disbursements from the Adaptive Management Fund in writing, based on identified protocols.

Protocols to designate environmentally beneficial adaptive management actions to be funded from the Adaptive Management Fund pursuant to the Adaptive Management Plan are detailed in the plan.

The protocols for funding prescribed instream flow increases will be the same as for the Water Acquisition Fund described in Section 9.2 A 3 of the MOU. The protocols for funding facility modifications will also 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 Adaptive Management Fund will contribute 60% of any resulting facility modification cost; if PG&E is in the majority opinion (in support of a proposed action expenditure), the Adaptive Management Fund will contribute 100% of any resulting facility modifications.

Interrelated and Interdependent Actions

For the purposes of this ASIP, an interrelated action is an action that is part of the proposed action (the Restoration Project) and depends on the proposed action for its justification. An interdependent action is an action that has no independent utility apart from the proposed action.

No interdependent actions have been identified for the Restoration Project. Potential interrelated actions are those related to the near-term maintenance and monitoring of restored compensation habitats, potential ongoing maintenance of project features, and future actions that may be implemented under the Adaptive Management Plan.

Activities that may be associated with the long-term operation and near-term maintenance and monitoring of compensation habitats are not expected to result in take of covered species. Potential ongoing near-term maintenance of project features may include activities to maintain access roads, fish screens, and fish ladders. Effects of these maintenance actions, if required, could include harassment of individuals of one or more covered species as a result of noise and other activities associated with the maintenance actions. The need for potential future long-term maintenance actions, however, cannot be predicted. Hand in hand with robust designs, reasonable long-term operating and maintenance requirements are critical to ensuring the reliable operation of the energy

production system and salmon restoration facilities. The best design of the facilities will take this need and the need for biological reliability into account. The need for reliable long-term operation should also be a consideration when recommending decommissioning and removal of several, more remote, installations. For the remaining energy production facilities, measures have been incorporated into the design of the facilities to produce cost-effective maintenance and operating requirements, thereby ensuring their reliable operation to meet both habitat and energy-production goals.

Actions that may be undertaken to improve the effectiveness of the Restoration Project under the Adaptive Management Plan could include, but may not be limited to, extensive monitoring to identify problems, examine possible solutions for meeting the biological objectives, and allow changes to contemporary strategies and actions within established limits to try to achieve the objective and desired results of the Restoration Project. Effects of these types of actions could result in harassment of individuals of one or more covered species; however, the overall purpose of adaptive management monitoring is for the benefit of these covered species (i.e., winter-run Chinook salmon, spring-run Chinook salmon, and steelhead).

Contribution to MSCS Goals

This section describes how the Restoration Project contributes to MSCS goals for covered species and NCCP communities.

Covered Species

The purpose of the Restoration Project is to improve fish passage and spawning and rearing habitat for anadromous fish in Battle Creek by removing five Hydroelectric Project diversion dams, installing fish screens and fish ladders at three remaining diversion dams, and increasing instream flows. These Restoration Project actions will contribute directly to the MSCS goal of recovery for the:

- Sacramento River winter-run Chinook salmon,
- Central Valley spring-run Chinook salmon, and
- Central Valley steelhead.

Implementation of the conservation measures identified in Chapter 4 to avoid, minimize, and compensate for effects will achieve the MSCS goal to maintain the following species:

- Central Valley fall/late fall–run Chinook salmon,
- northwestern pond turtle,
- bald eagle,

- Cooper's hawk,
- osprey,
- American peregrine falcon,
- yellow-breasted chat, and
- little willow flycatcher.

The MSCS goal for the valley elderberry longhorn beetle is to "recover the species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature." The Restoration Project is not designed to recover populations of the valley elderberry longhorn beetle and, therefore, does not meet this MSCS goal. However, implementing conservation measures identified in Chapter 4 will avoid, minimize, and compensate for effects of the Restoration Project on the beetle.

Covered NCCP Communities

The Restoration Project will substantially increase the ecological functions of North Fork and South Fork Battle Creek by increasing the extent and quality of spawning and rearing habitat for anadromous fish. Battle Creek is a perennial drainage that is classified as a montane riverine aquatic NCCP community, with montane riparian habitat at several locations along its banks. The Restoration Project will directly contribute to the MSCS goal for these NCCP communities to substantially increase the extent and quality of habitat, and, in the case of aquatic habitat, for the ecologically based fish group, anadromous fish species.

The MSCS goal for nontidal freshwater permanent emergent habitat is to substantially increase the extent and quality of this NCCP community. However, because the Restoration Project was not designed to increase the extent and quality of this wetland habitat, the ASIP goal for nontidal freshwater permanent emergent habitats is to avoid, minimize, and compensate for the loss of this habitat type.

For natural seasonal wetland habitat, the MSCS goal is to protect, enhance, or restore this wetland community. Implementation of the ASIP conservation measures for natural seasonal wetland habitat will ensure that this MSCS goal is met.

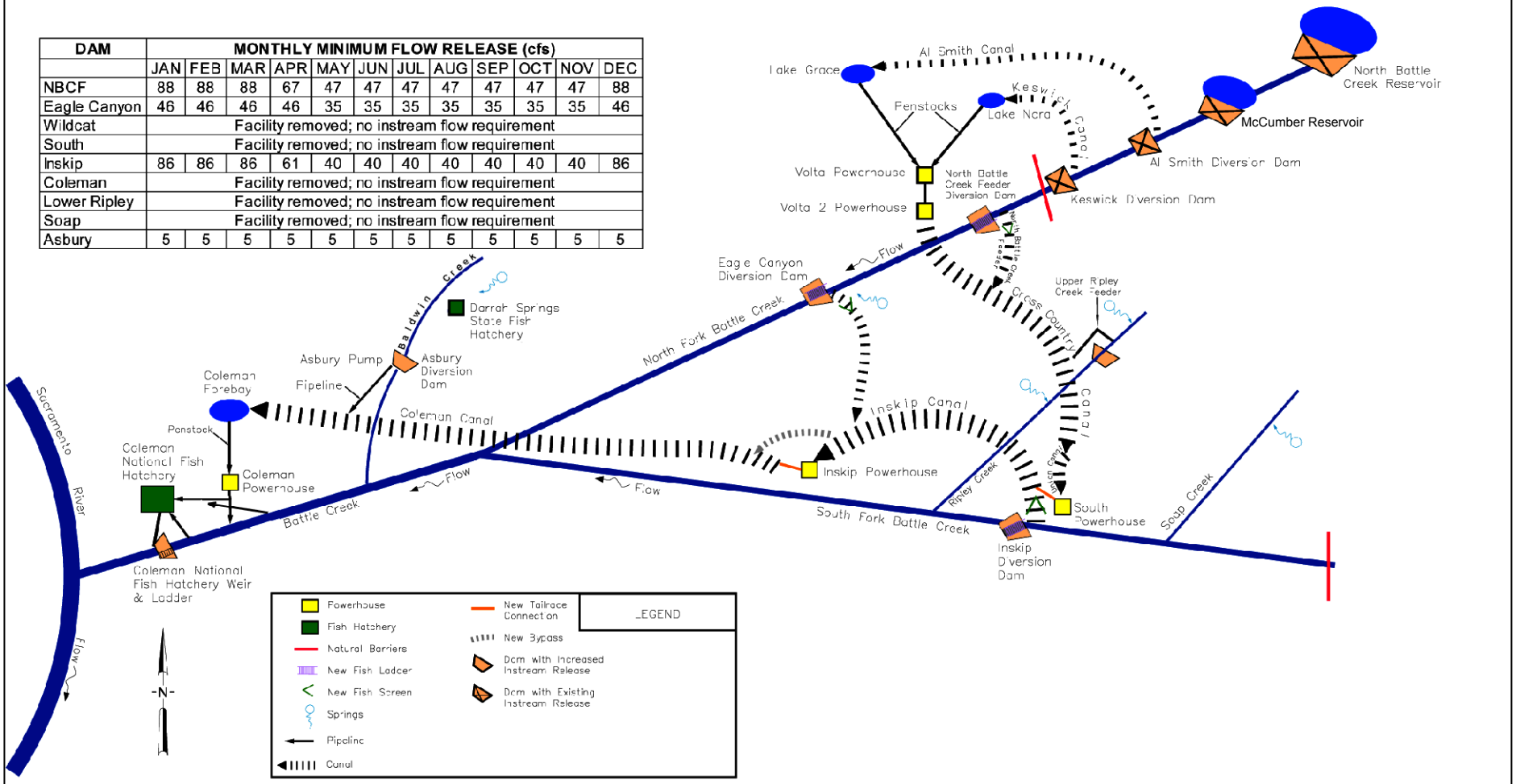
Implementation of the conservation measures to avoid, minimize, and compensate for effects will achieve the MSCS goal to restore the following temporarily and permanently disturbed NCCP communities:

- upland scrub (identified as mixed chaparral in the project area),
- grassland (identified as annual grassland in the project area), and

- valley/foothill woodland and forest (identified as live oak woodland, blue oak woodland/savanna, gray pine/oak woodland, and westside ponderosa pine in the project area).

Figure 2-1
Battle Creek Salmon and Steelhead Restoration Project Sites

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



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

Battle Creek Schematic

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

DRAWING : Battle Creek
Sheet of

03035.03 ASIP

Figure 2-2
Schematic of Restoration Project Proposed Actions

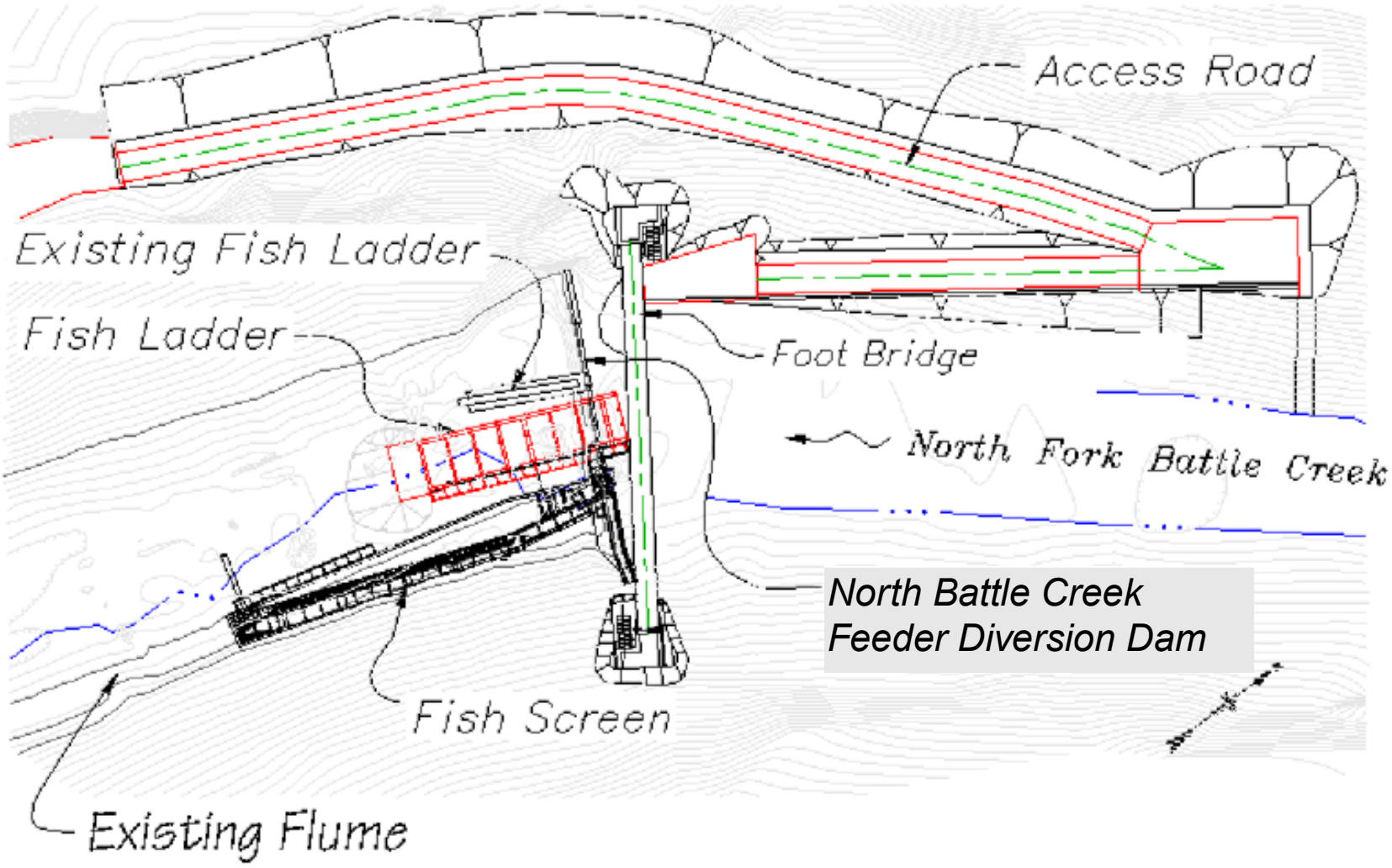


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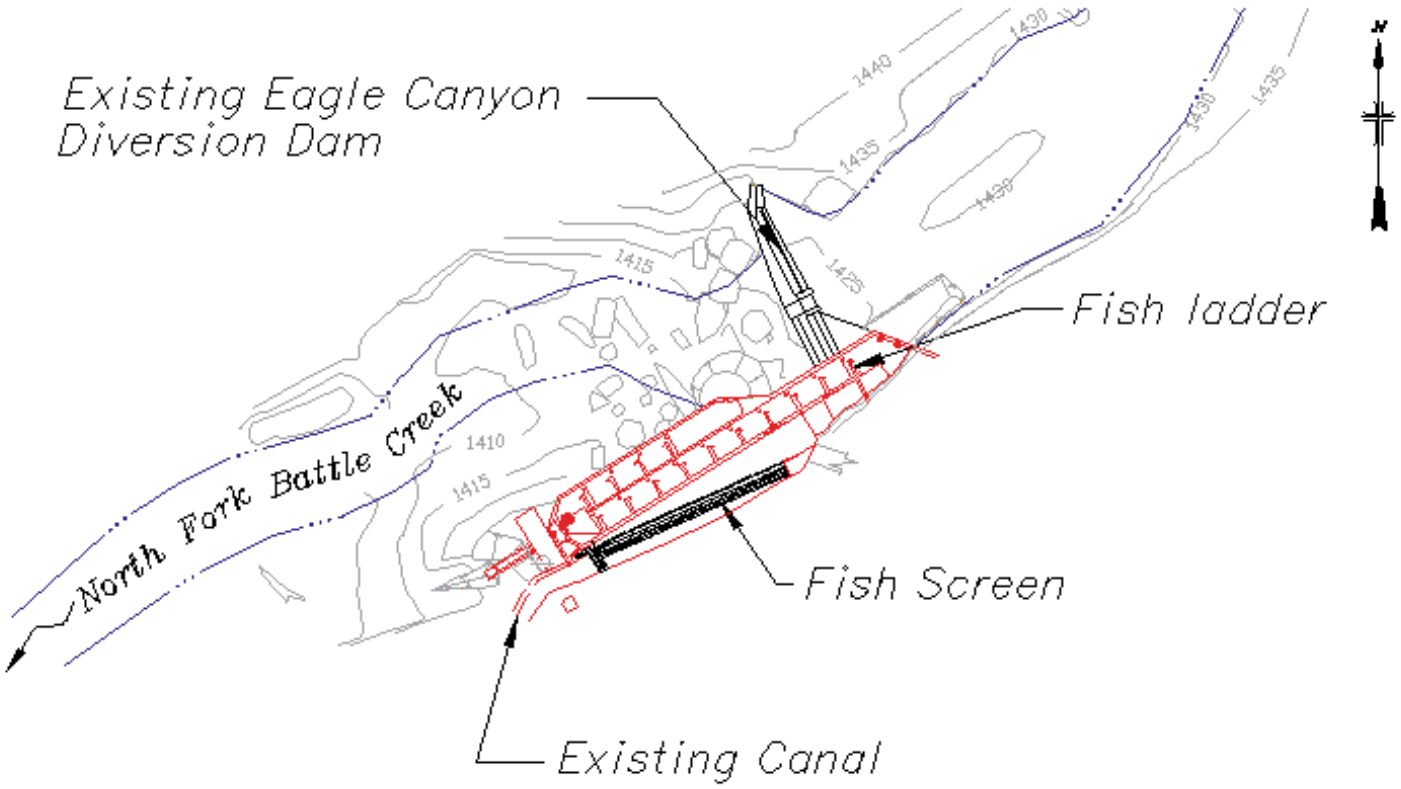
Figure 2-3
Proposed Facilities for the North Battle Creek Feeder Diversion Dam



No scale

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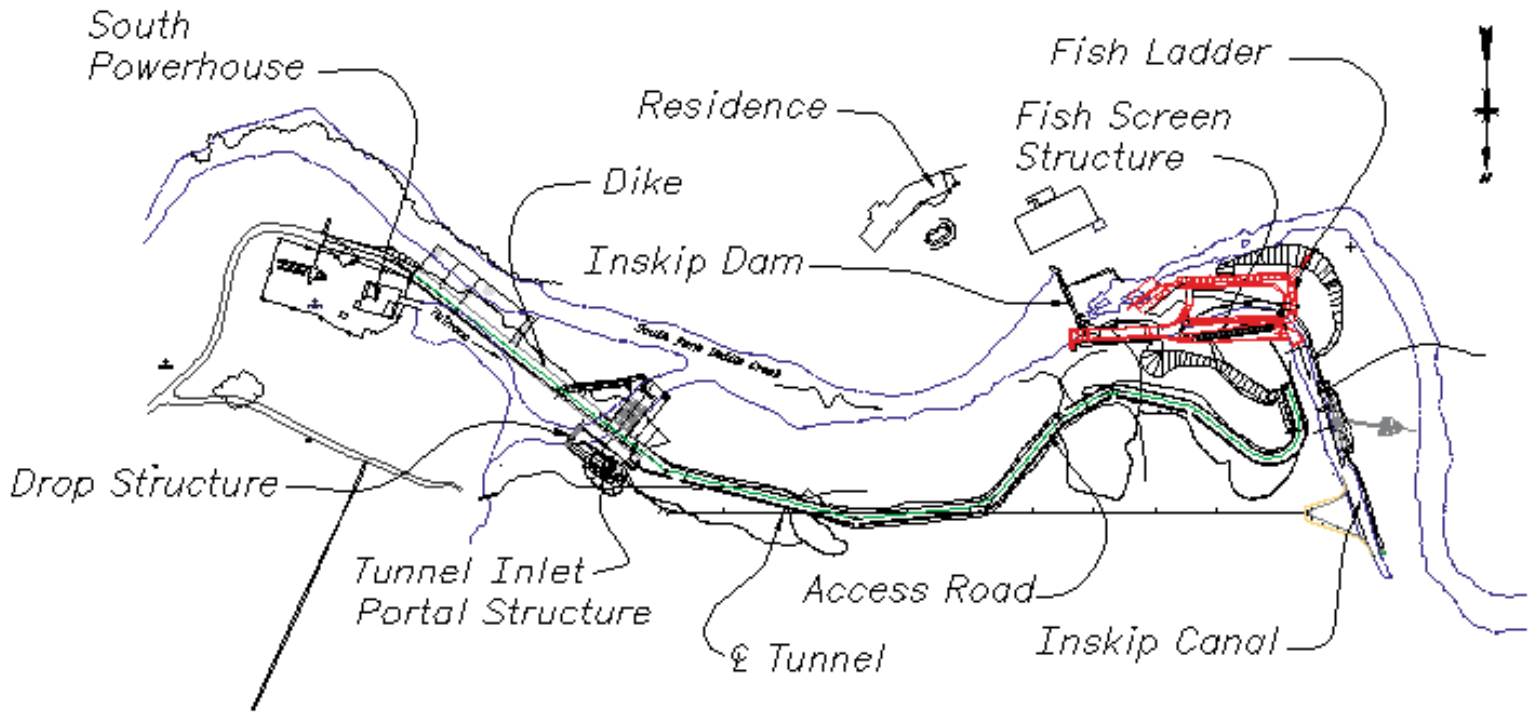
Figure 2-4
Proposed Facilities for the Eagle Canyon Diversion Dam



No scale

03035.03 ASIP

Figure 2-5
Proposed Facilities for the Inskip Diversion Dam/South Powerhouse

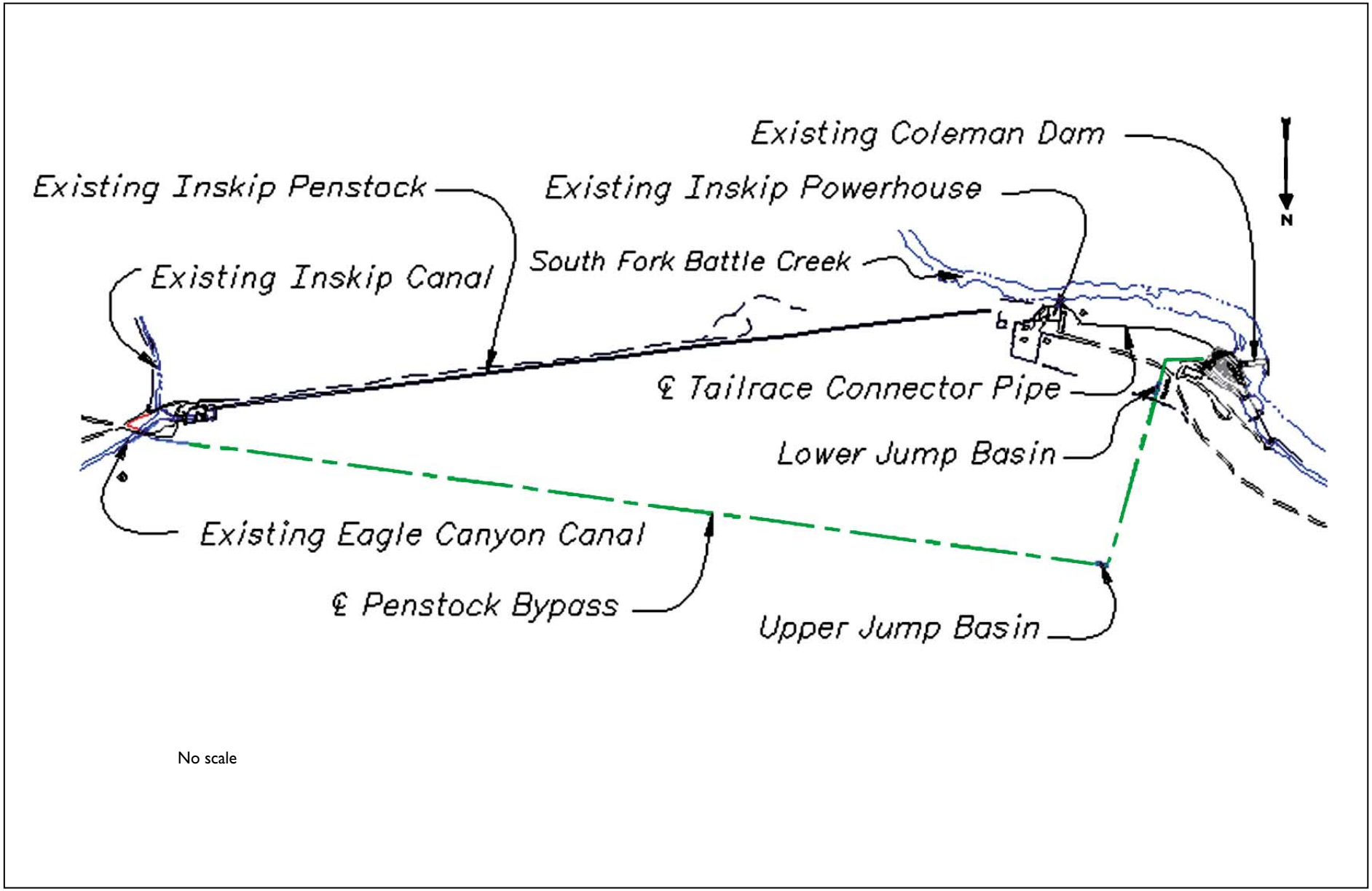


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Figure 2-6
Proposed Facilities for the Coleman Diversion Dam/Inskip Powerhouse