Environmental Assessment

Lower Mokelumne River Spawning Habitat Improvement Project
San Joaquin County, California

U.S. Fish & Wildlife Service
Anadromous Fish Restoration Program

CALFED Bay-Delta Program
Ecosystem Restoration Program

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1.0 INTRODUCTION

This Environmental Assessment (EA) was prepared by the U.S. Fish and Wildlife Service (Service) to assist in planning and decision making for restoration of anadromous fisheries habitat within the lower Mokelumne River, and to provide information to stakeholders and the general public during the planning process. The actions evaluated in this document are partially funded by Federal agencies and require Federal permits and approvals; therefore, environmental documentation under the National Environmental Policy Act (NEPA) is required.

The Mokelumne River is a major tributary to the Sacramento-San Joaquin River Delta and supports five species of anadromous fish. Fall-run Chinook salmon and steelhead trout are the primary management focus in the river immediately below Camanche Dam. Availability of spawning gravel in this section of the Mokelumne River has been determined to be deficient because historic gold and aggregate mining operations removed hundreds of thousands of tons of gravel annually, and upstream dams have reduced gravel transport to the area. This area was chosen because it is known to support fall-run Chinook salmon and steelhead spawning and because the substrate is suitable for spawning habitat improvement.

In 1998, the Service approved an *Environmental Assessment for the Anadromous Fish Restoration Program, Mokelumne River Spawning Gravel Improvement Project* which included a Finding of No Significant Impact. East Bay Municipal Utility District (EBMUD), the lead non-federal agency, completed the initial step in gravel enhancement and stabilizing of existing habitat described in the 1998 Environmental Assessment. The initial steps have focused on a 9-mile reach of the Lower Mokelumne River between Camanche Dam (RM 63.5) and Elliott Road (RM 54). From 1998 through 2000, a total of 3,600 cubic yards (yd^3) of spawning gravel was added at six selected sites. To continue the *Mokelumne River Spawning Gravel Improvement Project* the Service approved an Environmental Assessment in August 2004 covering the project years 2004-2008. Over that period, approximately 27,000 tons of gravel was placed at five sites within a 4-mile reach below Camanche Dam. EBMUD and the University of California at Davis have completed several monitoring and research projects revolving around these habitat enhancements and stabilizing efforts.

The proposed activities are an extension of the actions implemented following the 1998 and 2004 project proposals. Proposed project activities will occur in areas that have already been treated and are in need of gravel replenishment and rehabilitation. The proposed project consists of placing up to 5,000 yds^3 of suitably-sized salmonid spawning gravel annually for a 3-year period at two specific sites with annual supplementation of 1,000 yds^3 within the 1-mile reach below Camanche Dam. The objectives of the proposed project are to provide additional salmonid spawning gravel, improve intergravel water quality (i.e., the conditions between gravel particles that are conducive to spawning success), and increase bedslope thereby increasing floodplain connectivity and providing the energy needed to sustain river rehabilitation in the first one kilometer below Camanche Dam. The proposed spawning gravel replenishment and rehabilitation activities increase riffle to riffle bedslope to 0.4% (Pasternack 2006); increase available and usable spawning areas by providing spawning gravels within the appropriate size

range; increase use of spawning habitat; improve gravel permeability and intergravel water quality; decrease redd superimposition; and, ultimately, increase the natural production of fall-run salmon and steelhead trout in the Mokelumne River (Merz 1998). Increased gravel substrate will also increase production of aquatic invertebrates (Ochikubo Chan 2003), the food base for juvenile salmonids. The Service has contributed annually since 1998 and proposes to contribute funding towards this habitat restoration measure to protect and restore salmonid spawning habitat in the lower Mokelumne River.

The proposed action is consistent with several acts, programs, and plans involving Federal, State, and public entities that address protection, enhancement, and restoration of aquatic and riparian habitats within the Central Valley, including the Mokelumne River watershed. These acts, programs, and plans include the Central Valley Project Improvement Act's (CVPIA; Title 34 of Public Law 102-575) Final Restoration Plan for the Anadromous Fish Restoration Program (AFRP; USFWS 2001), the CALFED Bay-Delta Program's (CALFED) Ecosystem Restoration Program (ERP) Plan (CALFED 1999a, b), the California Department of Fish and Game's (CDFG) Steelhead Restoration and Management Plan for California (CDFG 1993), and CDFG's Restoring Central Valley Streams: A Plan For Action (CDFG 1993), among others. The principles and goals of these programs overlap, and provide the basis for the proposed project in the lower Mokelumne River.

1.1 CVPIA and CALFED Tiered Document

Whenever a broad environmental impact analysis has been prepared and a subsequent narrower analysis is then prepared on an action included within the entire program or policy, the subsequent analysis need only summarize the issues discussed in the broader analysis and incorporate discussions from the broader analysis by reference. This is known as tiering. Tiered documents focus on issues specific to the subsequent action and rely on the analyses of issues already decided in the broader programmatic review (CALFED 2000b).

Both the AFRP and ERP are components of broader programs, the CVPIA and CALFED, respectively. The CVPIA and CALFED programs each evaluated environmental effects of a range of alternatives, including provisions for fish and wildlife habitat restoration. The CVPIA program prepared a programmatic environmental impact statement (PEIS) (DOI 1999) and Record of Decision (ROD) (DOI 2001) in accordance with NEPA, and CALFED prepared a programmatic environmental impact statement/environmental impact report (PEIS/EIR) (CALFED 2000a) and ROD (CALFED 2000b) in accordance with NEPA and the California Environmental Quality Act (CEQA).

A programmatic environmental document is frequently used to evaluate new programs, analyze a series of actions that are part of a larger project, or consider broad policy alternatives and programmatic mitigation measures. It is especially important in evaluating the "system-wide" impacts of multiple actions. If it is determined that a proposed action was not fully addressed in the programmatic environmental document, a tiered document should be prepared to address details and site-specific factors of the action. This EA for the lower Mokelumne River Spawning

Habitat Improvement Project is a tiered document of the CVPIA and CALFED programs and adopts appropriate provisions of the CVPIA and CALFED RODs.

1.1.1 AFRP

The CVPIA authorizes and directs the Secretary of the Department of the Interior, in consultation with other State and Federal agencies, Indian tribes, and affected interests, to develop and implement a program which makes all reasonable efforts to at least double natural production of anadromous fish in California Central Valley rivers and streams. Anadromous fish include the Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), white sturgeon (*Acipenser transmontanus*), and green sturgeon (*A. medirostris*). Further, the CVPIA requires that this program give first priority to measures that protect and restore natural channel and riparian habitat values through habitat restoration actions, modifications to Central Valley Project operations, and implementation of the supporting measures mandated by the CVPIA.

The Department of Interior (DOI) approached implementation of this directive through AFRP development, with the Service assuming lead responsibility. The AFRP encourages local citizens and groups to share or take the lead in implementing restoration actions. This approach is consistent with "California's Coordinated Regional Strategy to Conserve Biological Diversity" (California Biodiversity Council 1991) in which 26 State and Federal agencies emphasize regional solutions to regional problems. The AFRP identified replenishment of gravel suitable for salmonid habitat in the lower Mokelumne River as a high priority (USFWS 2001).

Programmatic-level impacts and mitigation measures for the AFRP are described in the CVPIA PEIS (DOI 1999). The CVPIA PEIS specifically references spawning gravel in the lower Mokelumne River; “Camanche Dam prevents the natural recruitment of gravel from upstream sources to spawning areas below the dam. Net losses of spawning gravels and a general increase in size of streambed materials have reduced the amount of suitable spawning area. In addition, armoring or compaction of spawning substrate has reduced spawning gravel quality.” Most projects and activities implementing CVPIA programs would require separate, project-level environmental analyses tiering from the CVPIA PEIS. As stated in the CVPIA PEIS, “The PEIS is not intended to disclose site-specific impacts of implementing the CVPIA. Because of the necessary level of generality of assumptions used to perform a programmatic, region-wide analysis, many of the conclusions of the PEIS analysis cannot be directly applied to specific sites within the region or to a specific region.” Because the AFRP is a component of the CVPIA, AFRP-funded actions must tier from the CVPIA PEIS and be implemented in a manner consistent with the CVPIA ROD. In addition, mitigation measures and monitoring identified in the PEIS and ROD for CVPIA implementation must be incorporated into site-specific AFRP actions, where appropriate.

1.1.2 ERP

The CALFED Program began in May 1995 to address the complex issues that surround the California Bay-Delta. It is a cooperative, interagency effort of 18 State and Federal agencies with management or regulatory responsibilities for the Bay-Delta and was established to develop a long-term comprehensive plan that would restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The selected CALFED alternative comprises a set of broadly described programmatic actions intended to help agencies set the long-term, overall direction of the 30-year CALFED Program and make decisions on broad methods to meet program purposes. Programmatic actions include the Levee System Integrity Program, Water Quality Program, ERP, Water Use Efficiency Program, Water Transfer Program, Watershed Program, and Storage and Conveyance.

The ERP identifies specific programmatic actions designed to restore, rehabilitate, or maintain important ecological processes, habitats, and species within 14 ecological management zones. Relevant ERP actions include "On the Mokelumne River below Camanche Dam, provide annual supplementation of 1,200 to 2,500 yd^3 of gravel into the active stream channel to maintain quality spawning areas and to replace gravel that is transported downstream." The Lower Mokelumne River Spawning Habitat Improvement Project is consistent with the ERP's vision for the Mokelumne River Ecological Unit, which is to support self-sustaining fall-run chinook salmon and steelhead populations by improving streamflows, riparian and shaded riverine aquatic (SRA) habitat, natural sediment supply and gravel recruitment, and fish passage, among others.

Programmatic-level actions, impacts, mitigation measures, and monitoring requirements for the CALFED program are described in the CALFED PEIS/EIR (CALFED 2000a) and ROD (CALFED 2000b). Projects and activities implementing specific CALFED actions require separate, project-level environmental analyses tiering from the PEIS/EIR. The CALFED ROD states "for actions contained within the Preferred Program Alternative that are undertaken by a CALFED Agency or funded with money designated for meeting CALFED purposes, environmental review will tier from the Programmatic EIS/EIR. These actions will be carried out in a manner consistent with the ROD and incorporate mitigation strategies contained in Appendix A to this ROD." Appendix A to the CALFED ROD begins by stating "The CALFED Agencies commit to considering and adopting the following mitigation measures where appropriate in development and implementation of project specific actions. The mitigation measures address short-term, long-term, and cumulative effects of the CALFED Program."

1.2 Related Plans and Programs

In addition to the AFRP and ERP, other programs also identify fish passage, stream channel, and riparian habitat improvements as priority actions for the lower Mokelumne River:

Lower Mokelumne River Fisheries Management Plan (CDFG)
The Lower Mokelumne River Fisheries Management Plan produced by CDFG in 1991 evaluated in-stream flows, in-stream conditions, non-flow habitat conditions, fish populations, and food availability in the lower Mokelumne River. This document was prepared primarily to make

recommendations to protect Chinook salmon in the river, which had failed to consistently achieve desired population levels since the construction of Camanche Dam in 1964. Recommendations included many designed to benefit the natural reproduction cycle of anadromous fishes and to improve fish passage at Woodbridge Dam. Implementation of programs designed to restore, improve, and acquire riparian habitat were also recommended.

Federal Energy Regulatory Commission (FERC) Final Environmental Impact Statement (FEIS)

The FERC FEIS (FERC 1993) for "Proposed Modifications to the Lower Mokelumne River Project," FERC Project No. 2916-004, evaluated in-stream flows, in-stream conditions, and non-flow habitat conditions of the lower Mokelumne River. The document was prepared in conjunction with a license modification proceeding, which investigated proposed actions that would require modifications of hydropower facilities and/or operations of the lower Mokelumne River Project for the specific purpose of conserving river conditions in and along the Mokelumne River downstream of Camanche Dam. FERC staff examined and reported an array of potential flow and non-flow related mitigation actions, which could be implemented to stabilize and/or improve anadromous fish habitat conditions and contribute to protecting and enhancing fish and wildlife resources in and along the river. Non-flow actions evaluated included various habitat enhancement measures intended to benefit the natural reproduction cycle of Chinook salmon and steelhead trout in the lower river. The FEIS and the AFRP restoration plan contain very similar recommendations designed to reverse the trend of habitat deterioration on the lower Mokelumne River.

Lower Mokelumne River Joint Settlement Agreement

The Lower Mokelumne River Joint Settlement Agreement (Settlement Agreement) for the Mokelumne River Project, FERC No. 2916-004, regarding flow and non-flow measures appropriate for the lower Mokelumne River, was entered into among EBMUD, CDFG, and the Service on March 23, 1998 (EBMUD et al. 1998). When FERC issues a final order in the License Modification Proceeding No. 2916-004, the Settlement Agreement will become effective. The agencies entered into the Settlement Agreement with the understanding that implementing the array of flow and non-flow measures included in the Settlement Agreement could lead to reasonable protection and enhancement above current conditions for the anadromous fishery and other resources of the lower Mokelumne River ecosystem.

The Settlement Agreement specifically identifies minimum flow releases downstream of Camanche Reservoir and directs a commitment to ecosystem protection and enhancement, which includes (but is not limited to): spawning gravel improvements, riparian restoration, installation of fish screens, cooperating to improve fish passage at Woodbridge Dam, expanding coded wire tagging of all hatchery fish from the Mokelumne River Fish Hatchery, maintaining a database, and other actions to be determined by the Lower Mokelumne River Partnership and Partnership Steering Committee. To accomplish riparian restoration, associated actions such as riparian easements and geomorphological improvements would be considered.

In September 2008 a 10 year review was completed for the settlement agreement (JSA Partnership Committee 2008). Under the recommendations there are a number of strategies.

Strategy 3.0 specifies that annual gravel supplementation should continue using the configurations designed by the Spawning Habitat Integrated Rehabilitation Approach (SHIRA), developed by UC Davis and EBMUD.

Complete implementation of the Settlement Agreement actions would beneficially contribute to the anadromous fishery and other resources in the lower Mokelumne River. The Settlement Agreement recognizes that implementing all flow and non-flow measures included could constitute a reasonable contribution on the part of EBMUD toward the restoration goals for the lower Mokelumne River. Spawning habitat restoration is included in the AFRP, the FERC FEIS, and the Settlement Agreement. The AFRP and FERC FEIS acknowledge the beneficial effects of individual actions may not result in initially significant improvements, but when combined with other recommended actions for the river system, could be substantially beneficial.

1.3 Purpose and Need

The Mokelumne River system and its associated fish and wildlife habitats have incrementally deteriorated for over a century beginning with extensive gold mining in the 1850s. During and subsequent to the mining event, riparian habitat conversion and instream habitat modifications have continued to occur due to agricultural land development, gravel mining, water impoundment construction, increased water diversions, decreased instream flows, and levee construction. All these major actions and other events have led to the existing deteriorated riparian and aquatic habitat conditions of the Mokelumne River and its tributaries. In spite of all the habitat modifications, viable chinook salmon populations still occur in the lower reaches of the Mokelumne River downstream of Camanche Reservoir.

North American steelhead populations have experienced significant reductions in the past century. Estimated spawners in the Central Valley of California have declined from over 40,000 fish in the mid-1950s to less than 10,000 by the early 1990's (Hallock et al. 1961, Hallock 1991, McEwan and Jackson 1996). Historically, Central Valley steelhead were well-distributed throughout the Sacramento and San Joaquin river systems: from the upper Sacramento/Pit river systems south to the Kings and possibly Kern river systems in wet years (Yoshiyama et al. 1996). Currently, the Central Valley steelhead evolutionarily significant unit (ESUs) includes all naturally-spawned Central Valley steelhead and their progeny in all river reaches accessible to the Sacramento and San Joaquin Rivers and their tributaries in California (Federal Register 2000). Presently, the Central Valley contains only winter steelhead.

Factors contributing to this population decline include barriers to passage during migration, water diversions, flow fluctuations, sub-optimal water temperatures for incubation and juvenile rearing, sedimentation of spawning habitat, and low summer flows for emigration (Leidy 2000). Yoshiyama et al. (1996) estimated that more than 82% of Central Valley steelhead spawning and rearing habitat in the Central Valley had been lost.

Spawning habitat improvement projects are needed to optimize habitat for spawning chinook salmon and Central Valley steelhead trout (CDFG 1993a). The Draft Anadromous Fish Restoration Program Plan (1997) recommends the replenishment of gravel suitable for salmonid spawning habitat in the lower Mokelumne River. The California Department of Fish and Game recommends that about 22,700 yd^3 of gravel should be added to the lower Mokelumne River to improve spawning habitat (CDFG 1993a). The Draft CALFED Ecosystem Restoration Program Plan (1997) recommends providing annual supplementation of 1,200 to 2,500 yd^3 of gravel into the Mokelumne River downstream of Camanche Dam to maintain quality spawning areas and to replace gravel that is transported downstream.

Spawning gravel enhancement in the lower Mokelumne River has been shown to benefit the physical parameters associated with the spawning and incubation environment, improving salmonid embryo survival and enhancing the benthic macroinvertebrate community, an important food-source for Mokelumne River salmonids (Merz 2002; Merz and Setka 2004; Merz et al. 2004).

Taking action in the lower Mokelumne River would protect, enhance, and restore to the maximum extent possible, the rivers spawning habitat, while maintaining an equitable balance among other land and water uses, such as agriculture, municipal and industrial needs, flood control, and recreation. These efforts within the lower Mokelumne River would contribute toward the implementation goals of several existing Central Valley fish and wildlife restoration plans (described above) to create a healthier, more-natural functioning ecosystem; enhance and restore spawning habitats; protect threatened and endangered species; and augment cumulative efforts to at least double populations of anadromous fish in Central Valley streams.

1.4 Development of Proposed Restoration

The proposed project site is a section of the lower Mokelumne River located northeast of Lodi in San Joaquin County (Figure 1). The Mokelumne River is a major tributary to the Sacramento-San Joaquin River Delta (Delta) and supports five species of anadromous fish. Fall-run Chinook salmon *(Oncorhynchus tshawytscha)* and steelhead trout *(Oncorhynchus mykiss)* are the primary management focus in the river immediately below Camanche Dam because of the salmon's value as a sport and commercial fishery and the listing of the steelhead by the National Marine Fisheries Service as threatened. California Department of Fish and Game (DFG) has determined that the stretch of river between Camanche Dam and the confluence with the Delta is of considerable importance for maintenance and restoration of Chinook salmon and steelhead (California Department of Fish and Game 1991).

Availability of spawning gravel in this section of the Mokelumne River has been determined to be deficient because historic gold and aggregate mining operations removed hundreds of thousands of tons of gravel annually and upstream dams have reduced gravel transport to the area. Two gravel restoration areas have been identified on a 1-mile reach of the Mokelumne River between Camanche Dam and Mackville Road (Figure 2). This area was chosen because it

is known to support fall-run Chinook salmon and steelhead spawning and because the substrate is suitable for habitat improvement.

The project is a collaborative effort by EBMUD, USFWS, and DFG. Project activities coincide with recommendations in DFG's Central Valley Stream Restoration Plan (1993), USFWS's Final Anadromous Fish Restoration Program Plan (2001), and the CALFED ERP (1999b) that spawning gravel be replenished along the lower Mokelumne River to maintain good-quality spawning areas and replace gravel that was removed or is transported downstream.

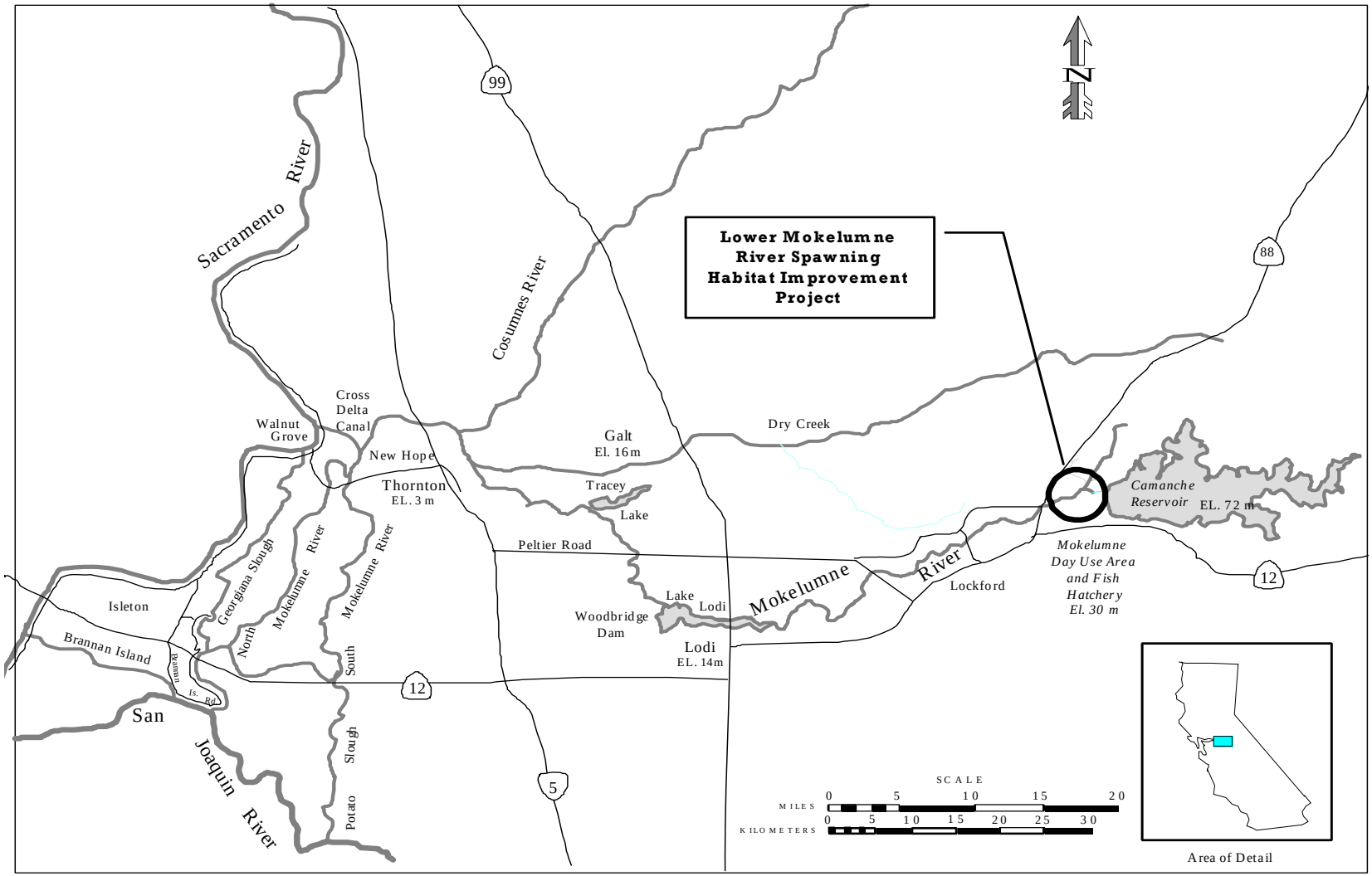

FIGURE 1 – REGIONAL LOCATION OF THE LOWER MOKELUMNE RIVER SPAWNING HABITAT IMPROVEMENT PROJECT

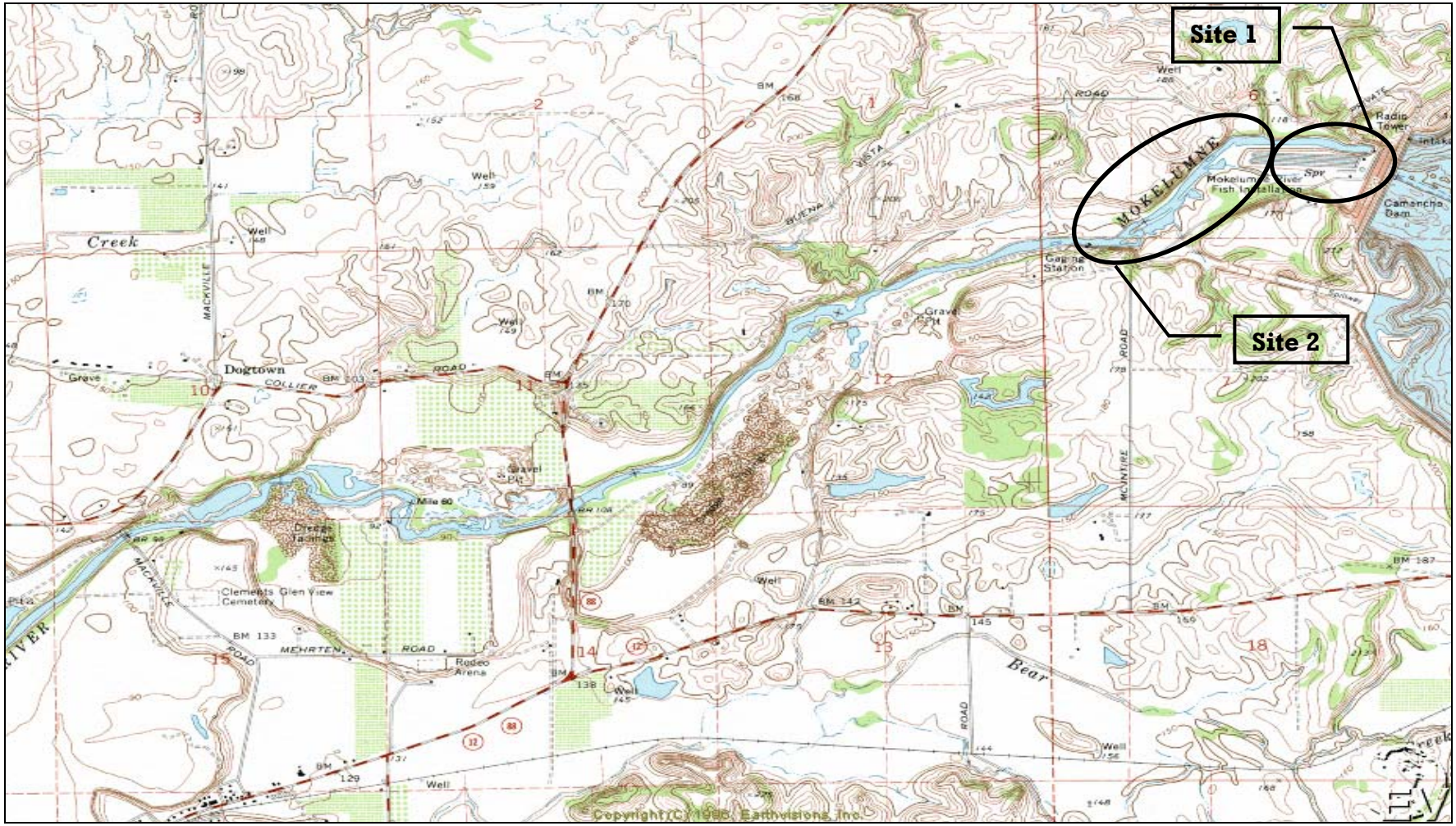

FIGURE 2 – PROPOSED SPAWNING GRAVEL IMPROVEMENT SITES

2.0 ALTERNATIVES

2.1 No Action Alternative

The No Action Alternative would not provide funding for this proposal under the AFRP or ERP. This alternative would continue the degredation of salmonid spawning habitat in the lower Mokelumne River as a result of Camanche Dam blocking the recruitment of suitable coarse sediment supply to the spawning areas below the dam.

2.2 Proposed Action Alternative

The AFRP proposes to fund portions ($200,000) of the spawning habitat improvement measures to protect and restore natural stream channel and spawning habitat values in the lower Mokelumne River. The total cost of the proposal is estimated at $100,000 annually for two years and $30,000 annual supplementation in perpetuity in addition to AFRP, is funded by EBMUD ($32,000 materials/services and $10,000 in-kind services annually). The following are the major elements of the proposed project.

The proposed project would take place in the 1-mile reach of the river between Camanche Dam and Mackville Road. Over the first 3-year period of the project, approximately 15,000 yds^3 of gravel would be added to the two sites indicated in Figure 2. Thereafter, annual supplementation of up to 1,000 yds^3 would occur within the 1-mile reach downstream of Camanche dam in the areas identified as needing spawning gravel restoration.

The proposed project consists of the annual placement of approximately 4,000 to 5,000 yds^3 of gravel (2,700-3,000 yds^3 of gravel 0.5-4 inches in diameter with a mean of 3 inches,1,800-2,000 yds^3 of gravel 0.25-2.5 inches in diameter with a mean of 2 inches,) in configurations designed by the Spawning Habitat Integrated Rehabilitation Approach (SHIRA) developed by the University of California, Davis at each site, for the first three years followed by annual maintenance gravel inputs of 600-1,000 yds^3 of the same sized gravel for the remaining permitted years. SHIRA incorporates a 2-d hydraulic model with a sediment mobility index and a habitat suitability model. The outcome is a specific design to enhance spawning habitat based on the hydraulic and sediment conditions at each site and the quantity of gravel placed.

Gravel for the enhancement project will be taken from an open, gravel quarry on the Mokelumne River floodplain. Smooth, uncrushed river rock from the George Reed, Inc. facility in Lockeford will be washed at the quarry, transported in steam-cleaned tractor-trailer transfer trucks or superdumps (with a capacity of 20-22 yds^3), and deposited onsite. Gravel will be deposited instream and manipulated by a rubber-tired front-end loader. This equipment will travel from the gravel quarry to the spawning replenishment sites on public or private roads and easement areas (existing roads), depending on the location of the site.

Instream gravel placement work will be accomplished during late-summer, low-flow periods (when flows are approximately 300 cubic feet per second [cfs]) to minimize effects on

anadromous fish. Placement of gravel for each of the 5 years will occur during an approximate 2 week period, with instream construction work requiring 3-5 days. Gravel placement will take place within the last 2 weeks of August and the first 2 weeks of September.

Monitoring and adaptive management

EBMUD would provide ongoing monitoring of the project area. The monitoring program would comply with AFRP and CALFED policies requiring monitoring of funded projects to assist the evaluation of long-term benefits to anadromous resources. Monitoring would be conducted immediately prior to project implementation and following restoration efforts. The actions would be monitored to determine effectiveness and remedial actions would be implemented to correct unsuccessful efforts. Monitoring would include pre- and post-project 3-d maps of the enhanced sites, and anadromous fish spawning use. An adaptive management approach would allow for remedial actions if established performance standards are not met.

3.0 AFFECTED ENVIRONMENT

The affected environment includes the physical characteristics and biological resources potentially affected by implementing the proposed action alternative. These include habitats, wildlife, vegetation, and fisheries in the area, as well as species listed as threatened or endangered under the Endangered Species Act of 1973, as amended (ESA).

The Mokelumne River system and its associated habitats have been affected by human activities for more than a century, beginning with extensive gold mining in the 1850s. One of the habitat deficiencies in the Mokelumne River is a lack of suitable gravel for salmonid reproduction. Downstream of Camanche Dam, the river's floodplain and channel were extensively mined to produce sand and gravel for construction aggregate. Reduction in flows and associated reduction in sediment transport in the lower Mokelumne River have modified the river's geomorphological and hydrological processes. Eliminating the natural processes has resulted in very limited gravel recruitment and immobility or compaction of the gravel that remains available for salmonid spawning. Gravel deficiency, changes in the timing and volume of natural flows, encroachment into the riparian zone, and alteration of seasonal stream temperatures have contributed to the decline in populations of naturally reproducing Chinook salmon and steelhead trout in the Mokelumne River.

Damming of rivers and streams inhibits the natural processes that are needed to maintain the quality of salmonid spawning gravel and habitat. Camanche Dam blocks the recruitment of suitable spawning gravel from upstream sources, and the regulated flows released from the dam reduce the natural scouring effect and sediment transport from floodflows, leaving the existing gravel compacted and armored with hardened sediment. The reduction in gravel recruitment and increase in gravel armoring results in a direct loss of suitable salmonid spawning habitat.

In 1990, East Bay Municipal Utility District (EBMUD) initiated an experimental spawning gravel project by placing about 500 yds^3 of suitable sized gravel in the lower Mokelumne River just below the fish diversion fence below Camanche Dam. The objective was to enhance

existing spawning areas as a means of increasing reproductive success of anadromous fishes. The project was continued in 1992, with about 300 yds^3 or gravel placed in the river in the vicinity of Murphy Creek. The project has been continued over subsequent years in cooperation with the California Department of Parks and Recreation, the California Department of Fish and the U.S. Fish and Wildlife Service. The projects have typically consisted of placing washed river gravel (1-4 inch diameter) in known spawning areas.

In the fall of 1993, 500 yds^3 of gravel were placed at the Mokelumne River Day Use Area (MRDUA). The following year, the substrate was ripped and another 100 yds^3 of gravel were placed at the MRDUA. In the fall of 1996, EBMUD placed over 650 yds^3 of washed river gravel at three sites (2 at the MRDUA, 1 near Mackville Road). In 1997, 1,500 yds^3 of gravel (1-8 inches in diameter) were placed at 3 sites (1 at the MRDUA, 1 near Mackville Road, and 1 about 1 mile below Mackville Road). In 1998, 1,200 yds^3 were placed at two sites (1 below Mackville Road and 1 at the MRDUA). In 1999, approximately 3,200 yds^3 were placed at two sites in the MRDUA. In 2000, approximately 1,200 yds^3 were placed at one site in the MRDUA. In 2001, 2002 and 2003 approximately 1,800, 2,100 and 2,300 yds^3 were placed, respectively. Additional enhancements were conducted in 2004 (3,319 tons), 2005 (3,729 tons), 2006 (6,060 tons), 2007 (7,148 tons) and 2008 (6,450 tons). Data collected by EBMUD since 1996 show that the projects increase intergravel permeability, dissolved oxygen (DO) content, and reduce intergravel water temperatures in most situations (Merz 1998). Benthic macroinvertebrates began colonizing new gravel within three days and their numbers equaled or surpassed population densities at unenhanced areas within ten weeks after gravel placement. Adult fall-run Chinook salmon also use new gravel for spawning within three months of gravel placement.

3.1 Vegetation and Wildlife

The Project area is dominated by valley foothill riparian woodland with annual grassland interspersed with vineyards. Valley foothill riparian habitat is dominated by cottonwood (*Populus fremontii*), white alder (*Alnus rhombifolia*), valley oak (*Quercus lobata*), and boxelder (*Acer negundo*) with an understory of wild rose (*Rosa californica*), wild grape (*Vitus californica*), California blackberry (*Rubus ursinus*), Himalayan blackberry (*R. discolor*), and buttonbrush (*Cephalanthus occidentalis*). Annual grasslands are dominated by introduced annual grasses, including wild oats (*Avena fatua*), ripgut grass (*Bromus diandrus*), foxtail chess (*Bromus madritensis rubens*), wild barley (*Hordeum* spp.), and foxtail fescue (*Vulpia myuros* var. *hirsuta*). Common forbs include broadleaf filaree (*Erodium botrys*), redstem filaree (*Erodium cicutarium*), turkey mullein (*Eremocarpus setigerus*), clover (*Trifolium* spp.), bur clover (*Medicago polymorpha*), popcorn flower (*Plagiobothrys nothofulvus*), and California poppy (*Eschscholzia californica*).

These habitats support several wildlife species on and/or adjacent to the proposed project sites. Species may include, but are not limited to, mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), river otter (*Lutra canadensis*), muskrat (*Ondatra zibethicus*), ground squirrel (*Spermophilus beecheyi*), skunk (*Mephitis mephitis*), and several other species of rodents. Several raptor species, resident and

migratory birds, valley quail (*Callipepla californica*), great blue herons (*Ardea herodias*), wild turkey (*Meleagris gallopavo*), and various species of egrets frequent the project area.

3.2 Fisheries

The lower Mokelumne River supports populations of 41 fish species, including 9 native species that occur in the project area (Pacific lamprey, Chinook salmon, chum salmon, steelhead trout, Sacramento hitch, Sacramento pikeminnow, Sacramento sucker, three-spined stickleback, and prickly sculpin). The project area is used by fall-run Chinook salmon and steelhead for spawning, rearing, and out-migration. Fall-run chinook salmon typically emigrate to the ocean in the spring of their first year and, after a few years in the ocean, return to their natal streams to spawn. The annual fall-run Chinook salmon migration in the Mokelumne River begins in early October, peaks in November, and tapers off in December and early January. Spawning generally occurs shortly after migration, primarily in late October through January. The salmon eggs incubate and hatch in the gravel between late October and April, depending on time of spawning and water temperature. The fry remain there until the yolk sac is absorbed and they begin to emerge, usually January and continuing until April. Most juvenile chinook salmon in the Mokelumne River have left the spawning areas by late March and have left the river by July of their first year (FERC 1993).

Before completion of Camanche Dam in 1964, chinook salmon spawned primarily between the town of Clements at River Mile (RM) 59.2 and a location about 3 miles below Pardee Dam. An unknown number of Chinook salmon also spawned upstream of Pardee Dam before its construction. According to current spawning surveys, the majority of salmon spawning now takes place within a 9-mile reach of the lower Mokelumne River between Camanche Dam and Elliott Road (RM 54). FERC (1993) stated that 95 percent of the suitable salmonid habitat is found within 3.5 miles of Camanche Dam, although scattered redds had been located between Elliott Road and Mackville Road.

EBMUD biologists have been conducting and/or sponsoring annual spawning surveys in the lower river since 1990. Chinook salmon escapements are also tallied as the fish pass Woodbridge Irrigation Dam (WID) in Lodi. Since the rebuild of WID in 2004, which resulted in limited video monitoring of passage, carcass surveys have been conducted in order to estimate escapement populations. Data generated from the Woodbridge Dam monitoring, carcass surveys, and Mokelumne River Fish Hatchery returns provide an estimation of the number of Chinook salmon within the system at any given time (EBMUD 1998).

In addition to the in-river spawning, a fish hatchery and rearing facility, the Mokelumne River Fish Hatchery, was constructed in 1964 on the south bank of the river at the base of Camanche Dam by EBMUD as mitigation for the loss of spawning habitat for Chinook salmon and steelhead trout in the Mokelumne River between Pardee and Camanche Dams. The hatchery is managed and operated by CDFG; EBMUD pays the annual operation and maintenance cost for all mitigation fish.

For the 43-year period since the dam was completed, Chinook salmon runs averaged 4,698 adults. Variations in run size and periodicity of the recorded data are comparable before and after the construction of Camanche Dam. However, the reliability of the pre-1964 data is questionable (FERC 1993). The AFRP's estimate of average natural production of fall-run chinook salmon in the Mokelumne River between the years 1967-1991 was 4,663 (USFWS 1995). The Final Restoration Plan for the Anadromous Fish Restoration Program (USFWS 2001) calls for a fall-run Chinook salmon production target of 9,300 for the Mokelumne River. The production target includes estimates of the in-river run, downstream harvest and ocean harvest. Average ocean harvest estimates for Mokelumne River stock for the period 1995-2007 was 7,668.

3.3 Threatened and Endangered Species

The Service has identified special status species that may occur in the action area (Appendix A). These include species that are federally listed as threatened or endangered or are proposed to be listed under the ESA. Federal candidates for listing and Federal Species of Concern that may occur in the action area have also been identified (Appendix A).

Based on project location, species' ranges and habitat types, several of these species may occur in the project vicinity. The listed, proposed for listing, and candidate species that may occur in the proposed project area and may be affected by the construction and operation of the proposed project are discussed below.

Invertebrates

Vernal Pool Fairy Shrimp – Threatened

Vernal Pool Tadpole Shrimp - Endangered

Special Status vernal pool crustaceans (vernal pool fairy shrimp, *Branchinecta lynchi*, and vernal pool tadpole shrimp, *Lepidurus packardi*) may occur in vernal pools, vernal swales, and other seasonal wetlands that pond water for 3 weeks or more. Surveys to date have not identified any vernal pool habitat in the project area or access routes; therefore, these species will not likely be affected by the proposed project.

Valley Elderberry Longhorn Beetle - Threatened

The Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) is a medium-sized beetle. This beetle is associated with elderberry shrubs and trees (*Sambucus* spp.) in the California Central Valley. Elderberries were observed during initial reconnaissance surveys of the specific project sites. Disturbance of individual plants as a result of fish barrier removal, fence construction and erosion/bank repair could result in take of larva or adults of the beetle. Determination of occupancy is difficult, so impacts on elderberries is considered by the USFWS as a potential take of Valley Elderberry Longhorn Beetle.

Fish

Delta Smelt – Threatened

Delta smelt (*Hypomesus transpacificus*) are found only from the Suisun Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties. Their historic

range is thought to have extended from Suisun Bay upstream to at least the city of Sacramento on the Sacramento River and Mossdale on the San Joaquin River. They used to be one of the most common pelagic fish in the upper Sacramento-San Joaquin Estuary.

Because delta smelt are a one-year species, their abundance and distribution may fluctuate widely from year to year. Years of major decline have been unusually dry years with exceptionally low outflows (1987-1991) and unusually wet years with exceptionally high outflows (1982, 1986). High outflows presumably flush delta smelt out of the system along with much of the zooplankton. This means that not only is potential spawning stock of delta smelt reduced, but its food supply as well. Depletion of established populations of invertebrates and fish may have made it easier for exotic species of copepods, clams and fish to colonize the estuary, which may be detrimental to delta smelt.

Central Valley Steelhead

Steelhead (*Oncorhynchus mykiss*) have the greatest diversity of life history patterns of any Pacific salmonid species, including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations. They prefer cold water between 55 and 70° F that is saturated with dissolved oxygen. In the Mokelumne River, steelhead exhibit two forms, a resident form that may remain in the river its entire life, and an anadromous form that migrates to the ocean and returns to the river to spawn.

Most Mokelumne River resident steelhead mature in 2 to 3 years. Most anadromous forms first spawn after spending 2 to 3 years in freshwater and then 1 to 2 years in the ocean, although small males that have spent only one year in freshwater and one year at sea occur regularly in some streams. Both resident and anadromous forms may be produced in the same nest and anadromous forms are known to spawn with residents. Spawning occurs in the spring in the Mokelumne River, but the spawning migration of anadromous forms extends from summer until the following spring. Most anadromous adults ascend the Mokelumne River between December and May. Females excavate a nest in gravel-bottomed riffles and select a mate. The eggs are buried in the nest after spawning. They hatch in 3 to 4 weeks and the fry emerge from the gravel 2 to 3 weeks later and begin feeding.

Central Valley spring-run Chinook Salmon - Threatened

Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) were extirpated from the San Joaquin River drainage by the late 1940's. The Mokelumne River lies outside of the Central Valley spring-run Chinook salmon ESU (70 FR 37160) and the corresponding designated critical habitat (70 FR 52488).

Winter-run Chinook Salmon - Endangered

Winter-run Chinook salmon (*Oncorhynchus tshawytscha*) are unique to the Sacramento River. They typically migrate upstream as immature silvery fish during winter and spring (December – July) and then spawn several months later in early summer (late April – early August). No winter-run Chinook salmon have been observed in the lower Mokelumne River since EBMUD

began monitoring salmon migration in 1990; therefore, this species will not likely be affected by the proposed project.

Amphibians

California Tiger Salamander-Threatened

California tiger salamanders (*Ambystoma californiense*) live west of the Sierra Nevada crest, from Sonoma and Yolo Counties in the north to Santa Barbara County in the south, and west to the outer coast range. Adult tiger salamanders are rarely seen. For most of the year they aestivate in the burrows of ground squirrels, gophers and other rodents in open wooded or grassy areas. They are found on the surface during periods of damp weather, almost exclusively at night. Breeding occurs during the winter rainy season. Salamanders metamorphose into land-dwelling juveniles by May or June. California tiger salamanders require a complex mixture of habitats, consisting of seasonally filled pools bordering on wooded savanna, although ponds and reservoirs may also be used. California tiger salamanders were not observed during initial reconnaissance surveys of the specific project sites; however, they have been observed in the vicinity.

California Red-legged Frog- Threatened

California red-legged frogs (*Rana aurora draytonii*) occur west of the Sierra-Cascade crest and along the Coast Ranges throughout the state below 3,900 ft. elevation. This threatened species inhabits quiet pools of streams, marshes, and occasionally ponds and prefers shorelines with vegetation. Although the project area falls within the geographic distribution range of this species, and suitable backwater habitat is present in abandonded gravel pits adjacent to the channel, the frog is highly unlikely to be found within the vicinity of the project sites. No red-legged frogs have been observed during previous site surveys of the mainstem of the river (K. Sanchez, EBMUD, personal communication). Bullfrogs and bass, common predators of California red-legged frogs, are common in the lower Mokelumne River.

Reptiles

Giant Garter Snake- Threatened

The giant garter snake (*Thamnophis gigas*) is one of the larger species of garter snakes. Historically, the range of this snake was the San Joaquin Valley from the vicinity of Sacramento and Antioch southward to Buena Vista and the Tulare Lake Basin. The current distribution extends from near Chico, Butte County, to the vicinity of Burrel, Fresno County. This species is one of the most aquatic garter snakes and is usually found in areas of freshwater marsh and low-gradient streams. Additionally, it has adapted to human-made habitats, such as drainage canals and irrigation ditches, especially those associated with rice farming. The giant garter snake inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period. Giant garter snakes typically select burrows with sunny exposure along south and west facing slopes. The breeding season extends through March and April, and females give birth to live young from late July through early September. Young immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own.

Habitat requirements consist of (1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter.

Plants

Succulent Owl's Clover - Threatened

The succulent owl's-clover (*Castilleja campestris* ssp. *succulenta*), like the Special Status vernal pool crustaceans, may occur in vernal pools, vernal swales, and other seasonal wetlands that pond water for 3 weeks or more. Surveys to date have not identified any vernal pool habitat in the project area or access routes.

3.4 Hydrology, Stream Channel, and Water Quality

"Eastside Streams" is a collective term applied to the streams that flow westward into the Delta region from the Sierra Nevada. They comprise the Cosumnes, Mokelumne and Calaveras Rivers, and Dry Creek. The Mokelumne is the largest of the Eastside Streams with a watershed of 661 mi^2. In contrast with the other streams, the Mokelumne watershed originates high in the Sierra Nevada. Consequently, river flows are driven by snowmelt. The Cosumnes River, Dry Creek, and Murphy Creek are tributaries to the lower Mokelumne River.

A number of reservoirs on the Mokelumne regulate stream flow. Camanche Reservoir, downstream of Pardee, is the largest and lowest reservoir with a storage capacity of 430,800 acre-feet. It is operated for flood control and to meet downstream instream flow requirements. Camanche Reservoir has a significant hydrologic effect on the lower Mokelumne River, providing year-round flow and cool water temperatures as a result of reservoir management.

Prior to construction of surface water impoundments and diversions on the creek, temperatures were more dependent upon cooler stream flows from upper elevations. Subsequently, temperatures are now more dependent on ambient air temperature, Camanche Reservoir water temperature, wind, humidity, amount of direct sunlight, and reservoir upwellings. Instream temperature also is affected by the shade provided by riparian vegetation.

3.5 Air Quality

The proposed restoration is within the eight county San Joaquin Valley Air Basin. The San Joaquin Valley Unified Air Pollution Control District monitors air quality in the county. Air quality throughout the basin is affected by a combination of air contaminants, meteorological conditions, and the topographical configuration of the valley. Atmospheric conditions such as wind speed, wind direction and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. A primary factor leading to the increase of air pollution is population growth. Accompanying population growth

in the area is additional smog produced by operation of vehicles, industrial processes, mining operations, and by agricultural activities, such as burning agricultural byproducts or dust from plowing.

Presently, San Joaquin County is designated as a nonattainment area for Federal and State standards with regard to particulate matter less than 10 microns in diameter (PM10) and ozone. The portions of the county outside the Stockton urban area, are designated as an attainment area for both Federal and State carbon monoxide (CO) standards.

3.6 Noise

Based on noise studies in the United States and California's Central Valley, planners generally accept that a direct relationship exists between population density and associated noise levels, with less populated areas typically having a lower noise level (Table 1). Noise planning standards and noise control ordinances within California's Central Valley are fairly uniform, typically ranging within 5 dBA for a similar land use category. Land use within the lower Mokelumne River project area is partially developed rural; therefore, associated noise levels in the area should be approximate to corresponding levels in Table 1. The project area has relatively few noise receptors such as residences and businesses.

Table 1. Noise levels correlated with land use categories ranging from undeveloped rural to urban (adapted from CALFED 2000a).

Location	Person/km^2	L_{dn} (dBA)*
Rural		
Undeveloped	8	35
Partially developed	23	40

*Average sound level for a 24-hr period expressed in decibel units on a human perception scale

3.7 Transportation

The proposed action vicinity includes portions of northern San Joaquin County. The area can be characterized as predominately rural, with agriculture as the primary activity. The nearest primary transportation corridors to the proposed action site are Highway 88 and Highway 12. McIntire Road, Collier Road and Mackville Road are the nearest secondary roads. These highways and roads would be used by construction workers to access the specific action sites. A few unimproved roadways in the vicinity are privately owned and used for agricultural purposes. Low volume/intermittent vehicles and free flow presently characterize traffic and circulation within the area.

3.8 Recreation

Recreational activities in the vicinity of the proposed project are limited to public access at the Mokelumne River Day Use Area because the majority of adjacent river property along the proposed project's 1-mile reach is privately owned. Most recreational activities taking place in the project area include onshore fishing, picnicking, limited hiking, and non-motorized boating.

3.9 Socioeconomic Conditions and Land Use

The majority of land adjacent to the project area is rural and privately owned, and the primary land use is agricultural. Many tracts are under active cultivation with orchards and vineyards, and there are several actively grazed annual grassland pastures in the project area. Most of the residences located within the rural setting of the project area are associated with agricultural holdings and operations.

3.10 Cultural Resources

The National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470f): provides for the protection, preservation, and consideration of historic and archaeological resources on Federal lands, or potentially effected by Federal actions. As the lead Federal agency for this proposed project, the Service has the responsibility to protect these resources, pursuant to section 106 of the NHPA.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Vegetation and Wildlife

4.1.1 No Action Alternative

With the No Action Alternative, it is anticipated that the remnant riparian areas would continue to deteriorate because the majority of land along both sides of the river within the project area is privately owned and is either under cultivation or used for grazing. The encroachment of the riparian zones will continue without implementation of protection and/or riparian enhancement actions. In addition to the obvious disturbances that historic gold and gravel mining activities have had on the river's riparian zone, agricultural influences (grazing within the riparian area and cultivated orchards and vineyards abutting the river's banks) continue to impact and deteriorate the health and reduce the width of the riparian vegetation corridor along the river. Without proactive actions to implement fish and wildlife protection, efforts would not occur unless local agencies and individual landowners pursued protection and enhancement measures.

4.1.2 Proposed Action

Any vegetation resources that may be affected by the proposed spawning habitat restoration activities would be limited to specific river access sites within the narrow riparian corridor along the lower Mokelumne River. To ensure there is no net loss to existing riparian vegetation,

measures have been incorporated in the proposed project to avoid or minimize adverse effects on sensitive species and habitats.

Implementation of the proposed project-related actions could have short-term affects on riparian vegetation adjacent to the gravel enhancement sites. There may be minimal disturbances to vegetation in the gravel transport staging areas and bankside at some of the river access points. Minor trimming of riparian vegetation may be necessary to facilitate access of equipment to the instream spawning gravel enhancement sites. Since public and/or private haul roads will be used to transport the gravel to the river sites, no roads will need to be constructed. The majority of vegetation expected to be disturbed by the project activities are grasses and forbes; willows and non-native blackberry vines, also may be affected if they are located in the access path to the river's edge. Noise and human activity at work sites could temporarily disturb wildlife. In some cases, wildlife could be subject to injury or mortality. Detrimental fuel and oil spills or leaks are possible. With implementation of mitigative measures (Appendix B) to minimize and compensate for potential adverse effects, unavoidable adverse effects should be unlikely, minor and short-term.

Monitoring is designed to evaluate biological conditions and not alter them. Most adverse effects would stem from disturbance of habitat or wildlife by human intrusion. However, mitigation measures for monitoring vegetation and wildlife would be applied, and any remaining adverse effects from monitoring should be minor and temporary.

4.2 Fisheries

4.2.1 No Action Alternative

The No Action Alternative would likely result in continued degradation of the salmonid spawning habitat in the lower Mokelumne River. One of the habitat deficiencies in the Mokelumne River is a lack of suitable gravel for salmonid reproduction. Downstream of Camanche Dam, the river's floodplain and channel were extensively mined to produce sand and gravel for construction aggregate. Reduction in flows and associated reduction in sediment transport in the lower Mokelumne River have modified the river's geomorphological and hydrological processes. Eliminating the natural processes has resulted in very limited gravel recruitment and immobility or compaction of the gravel that remains available for salmonid spawning. Without gravel replenishment, the existing gravel deficiency and lack of gravel recruitment will suppress the restoration of populations of naturally reproducing Chinook salmon and steelhead trout in the Mokelumne River.

4.2.2 Proposed Action

Gravel placement and repairing minor erosion/bank instability could result in temporarily increased water temperatures, siltation, and reduced dissolved oxygen, which could potentially have a short-term impact on Chinook salmon and steelhead. Mitigation measures (Appendix B) have been incorporated into the proposed restoration activities to avoid or minimize negative

effects on fish. Project implementation would occur during the period of August and September, when listed anadromous fishes are not expected to be present in the river.

4.3 Threatened and Endangered Species

4.3.1 No Action Alternative

Attempts by Federal and State programs to protect and increase the natural production of anadromous salmonids in the lower Mokelumne River watershed and the Central Valley may be hindered by the No Action Alternative. Without enhancement, the existing aquatic and riparian habitats could continue to slowly degrade and adversely affect populations of Central Valley steelhead trout and fall/late-fall run Chinook salmon. In addition, this alternative would not provide any short- or long-term benefits to any other special status species associated with the aquatic and riparian ecosystems.

4.3.2 Proposed Action

An informal intra-Service section 7 consultation under the ESA within the Sacramento Fish and Wildlife Office determined that implementing the Proposed Action with the conservation measures (described below) incorporated into restoration activities is not likely to adversely affect any of the species listed in Appendix B under the jurisdiction of the Service. An informal inter-agency section 7 consultation under ESA with NMFS was also initiated for the relevant species under their jurisdiction (anadromous fish). The NMFS concurred with the Service's determination that the Proposed Action is not likely to adversely affect the Central Valley steelhead or the fall/late-fall-run Chinook salmon in a letter dated August 5, 2009.

Vernal Pool Fairy Shrimp - Threatened
Vernal Pool Tadpole Shrimp - Endangered

No vernal pool habitat has been identified in the project area to date. If identified in pre-construction surveys, vernal pools would be surrounded with bright orange fencing to prevent disturbance. Construction activities would be avoided within 250 feet of pool margins and swale edges. Activities beyond 250 feet would be avoided if they could eventually result in adverse effects to the pools and swales through changes in hydrology, sedimentation, or contamination of the habitat. If pools or swales cannot be avoided, the Service would be notified in writing as soon as possible, and all information provided to the Service as requested. Because avoidance measures would be applied to the spawning habitat improvement effort, the Proposed Action is not likely to adversely effect these vernal pool crustaceans.

Valley Elderberry Longhorn Beetle - Threatened

Elderberry shrubs are known to occur in the riparian corridors along the streams, preliminary site surveys located plants in the project area. East Bay Municipal Utility District property in San Joaquin County is covered by a Certificate of Inclusion to USFWS incidental take permit TE12194-0 for valley elderberry longhorn beetle (USFWS 2007) under the Lower Mokelumne River Safe Harbor Agreement (MRSHA). Habitat enhancement projects, including gravel enhancement, are covered under the MRSHA.

A 100-foot buffer would be established and maintained around any elderberry shrubs containing stems measuring 1.0 inch or greater in diameter at ground level during implementation of restoration activities. The Service must be consulted before any disturbances in the buffer area are considered. If any removal of non-native vegetation is necessary within the buffer area, all work would be conducted by hand with special care taken to avoid impacts to elderberry shrubs. As part of the MRSHA, any reduction in elderberry bushes containing stems measuring 1.0 inch or greater will be replaced pursuant to the authorization and reported to the USFWS as part of the yearly summary of activities. Because avoidance measures would be applied at each site, no direct, indirect, or cumulative adverse effects on valley elderberry longhorn beetles should occur. Therefore, the Proposed Action and post-project monitoring are not likely to adversely affect this species.

Delta Smelt - Threatened

Delta smelt do not occur in the project area (above Woodbridge Irrigation District Dam) and would not be directly affected by the Proposed Action. Potential indirect effects, such as changes in flows to the Delta, also would not occur because the proposed restoration would not alter the hydrology of the Mokelumne and San Joaquin Rivers. Therefore, delta smelt are not likely to be adversely affected by the Proposed Action.

Central Valley Steelhead - Threatened

The Proposed Action would help protect and restore the native anadromous fisheries habitat and associated uplands along the lower Mokelumne River. Central Valley steelhead trout and fall/late-fall run Chinook salmon would benefit from restoration of important aquatic rearing and spawning habitats. All anadromous salmonids would benefit from improved water quality conditions within the enhancement sites.

Implementing the following measures would minimize adverse effects on listed salmonids and associated habitats:

- To avoid disturbing steelhead and fall/late-fall run Chinook salmon, all ground disturbing activities shall be conducted during the period of August to mid-September, when it is highly unlikely that these salmonids would be spawning in the lower Mokelumne River.
- To protect the water quality of the river during gravel placement, all in-stream work shall use construction and drainage BMPs.

California Tiger Salamander - Threatened

Ground-disturbing activities, such as transporting and stockpiling gravel, have the potential to negatively impact this species. These activities would occur when salamanders are underground during their estivation period between August and mid-September. Movement of heavy equipment to and from project sites and staging areas would be confined to existing roadways to minimize potential disturbance. The construction area would be confined to the minimum necessary for construction activities. Post-project activities (monitoring) are not likely to adversely affect this species.

California Red-legged Frog – Threatened
No red-legged frogs have been observed during previous site surveys of the mainstem of the Mokelumne River. Furthermore, bullfrogs and bass, common predators of California red-legged frogs are common in the lower Mokelumne River. Therefore, no adverse effects on California red-legged frogs are expected due to the presumed absence from the project area.

Giant Garter Snake - Threatened
It is unlikely that giant garter snake habitat would be found in the project area because the project area occurs at the margin of the known distribution of the species. Additionally, riparian woodlands generally do not provide much suitable habitat because of excessive shade, lack of basking sites, and reduced prey populations.

All ground disturbing activities would be limited to the period of August through mid-September, when the snakes are usually active. The project would be surveyed for the snake 24-hours prior to any construction activities by a Service-approved biologist, and any sightings reported to the Service. Survey of the project area would be repeated if a lapse in construction activity of 2 weeks or greater has occurred. Movement of heavy equipment to and from project sites and staging areas would be confined to existing roadways to minimize potential disturbance. The construction area would be confined to the minimum necessary for construction activities. The Proposed Action is not likely to adversely affect the giant garter snake.

Succulent Owl's Clover - Threatened
Habitats and conservation measures for vernal pool and vernal swale plant species are the same as those described above for vernal pool crustaceans. Because avoidance measures would be applied to the project site, adverse effects on vernal pool plants are not likely to occur.

4.4 Hydrology, Stream Channel, and Water Quality

4.4.1 No Action Alternative
The No Action Alternative would maintain current conditions on the Lower Mokelumne River. The hydrology of the area would be expected to continue relatively unchanged. Reduction in flows and associated reduction in sediment transport in the lower Mokelumne River have modified the river's geomorphological and hydrological processes. Eliminating the natural processes has resulted in very limited gravel recruitment and immobility or compaction of the gravel that remains available for salmonid spawning.

4.4.2 Proposed Action
With the Proposed Action there would be a general improvement in hydrologic function and water quality. Improved hyporheic water quality and enhanced substrate morphology in the lower Mokelumne River would result in improved salmonid spawning conditions. There would also be improvements in intergravel water temperatures (lower in summer) and dissolved oxygen levels due to improvements in stream channel morphology.

Instream activities associated with the Proposed Action would result in soil disturbance and could cause a potential discharge of oils and grease from the heavy equipment that would be used to place gravel. Soil and associated contaminants that enter the stream channel can increase turbidity, stimulate the growth of algae, increase sedimentation of aquatic habitat and introduce compounds that are toxic to aquatic organisms. To limit these circumstances, the project proponent would develop an erosion control plan and implement mitigation measures and BMPs (Appendix B). The project proponent also would comply with Section 401 of the Clean Water Act and obtain certification that project-related activities would maintain water quality at, and downstream of, the project site.

4.5 Air Quality

4.5.1 No Action Alternative

The No Action Alternative would maintain current conditions on the lower Mokelumne River.

4.5.2 Proposed Action

The proposed restoration activities could have construction-related impacts on air quality. Effects on air quality would include generation of dust and PM10 matter from transportation of material to sites and operation of heavy equipment.

Nearby residences and recreation areas may be subject to short-term episodes of blowing dust and increased levels of PM10 from construction equipment. Construction-related emissions include CO, reactive organic gases, oxides of nitrogen, and PM10. These pollutants would be emitted in equipment exhaust over the course of project implementation and from trucks hauling material to the various project sites. Although construction-related impacts would be temporary, construction activity has the potential to generate measurable amounts of pollutants, adding to regional ozone and PM10 levels that are already in violation of Federal and State standards. The San Joaquin Valley Unified Air Pollution Control District considers the emission of any nonattainment pollutant to be a significant impact. This impact would be reduced with implementation of mitigation measures (Appendix B) during gravel placement and transportation of material to sites.

4.6 Noise

4.6.1 No Action Alternative

Without the Proposed Action noise conditions in the lower Mokelumne River area would not be affected.

4.6.2 Proposed Action

Noise levels would be expected to increase from construction activities and construction equipment operation, such as trucks on haul roads and equipment at the gravel placement sites. Given mitigation measures for noise (Appendix B) incorporated into proposed actions, adverse effects from noise are anticipated to be short-term and minor.

4.7 Transportation

4.7.1 No Action Alternative

Without implementation of the Proposed Action there is no mechanism that would alter traffic-related conditions in the lower Mokelumne River area.

4.7.2 Proposed Action

Project activities could result in increased traffic on local roads related to the transport of construction workers, equipment, and materials to and from the restoration sites. Construction workers and equipment would likely travel along a series of state, county, and local roads to access the individual sites and the project does not entail construction of new roads. Because of the relatively small size of the project, the increases in project-related traffic would be minor. Annually, the Proposed Action would be completed over a five-day period with 15 to 40 vehicle trips daily. Some of the access is on private property on unsurfaced roads. The project would not generate a need for parking. Post implementation work would generate fewer than one vehicle trip per day per site. Mitigation measures in Appendix B would be applied, as necessary.

4.8 Recreation

4.8.1 No Action Alternative

Without implementation of the Proposed Action the recreational opportunities presently available on the lower Mokelumne River would not change.

4.8.2 Proposed Action

Although in-river gravel placement may impede recreational activities at specific sites, most recreation use within the project area takes place on weekends and holidays. With implementation of the proposed project, any short-term impacts on recreational opportunities would likely be due to instream activities. These possible impacts might impede use of the immediate vicinity in the sites and would create short-term public safety concerns for recreationists such as canoeists and anglers. If gravel placement activities occur in areas open to public access, access will be temporarily restricted during construction periods to address safety concerns. Project construction will occur only on weekdays to further reduce conflicts with recreational use.

4.9 Socioeconomic Condition and Land Use

4.9.1 No Action Alternative

Without implementation of the Proposed Action the socioeconomic and land use conditions present on the lower Mokelumne River would not change.

4.9.2 Proposed Action

Under the Proposed Action Alternative, the proposed spawning habitat improvement project would be funded via cost-sharing by EBMUD and the Service's CVPIA AFRP restoration funds. Gravel would be purchased locally and placed by local contractors, providing approximately $183,800 to the local economy. Improving salmonid spawning habitat could increase spawning in the river and contribute to the long-term goal of increasing natural populations of salmonids in the lower Mokelumne River. Restoration and increased salmon and steelhead production would have long-term economic and intrinsic community benefits. In addition to the short-term employment opportunity and long-term intrinsic community benefits, the potential increases in anadromous fish production would have a positive, long-term effect on the commercial and sport fishing industries. The level of this effect cannot be quantified.

4.10 Cultural Resources

4.10.1 No Action Alternative

Cultural and historic resources would not be affected under the No Action Alternative.

4.10.2 Proposed Action

As part of the EA for the 2004-2008 lower Mokelumne River gravel enhancement project, a Cultural Resources Compliance Request was prepared and submitted to the Service's Regional Cultural Resources Office for review and evaluation on July 21, 2004. For the 2004-2008 project, the Service Regional Archaeologist, following stipulations set forth in the Programmatic Agreement, determined that the project would not affect or impact cultural resources. For the proposed project, if any cultural resources are encountered during construction all work in the area of the discovery would be halted until appropriate mitigation was completed. Appropriate mitigation measures are summarized in Appendix B.

5.0 CUMULATIVE IMPACTS

Actions addressed within this document include restoration of anadromous fish rearing and spawning habitat on the lower Mokelumne River. Other restoration projects are expected to be coordinated with this restoration effort, but be funded separately from this project. Potential cumulative actions related to salmon habitat improvements proposed individually or under additionally funded programs outside the scope of this document include screening water diversions, water acquisition, addressing fish passage problems in the lower Mokelumne River, and possible future actions related to the Lower Mokelumne River Project (FERC Project No. 2916-004) Joint Settlement Agreement. Programmatic environmental compliance under NEPA,

including cumulative impacts, and ecological rationale for potential actions and associated environmental benefits are provided in the EISs and RODs for the CALFED Bay-Delta Program (CALFED 2000a, b) and CVPIA (DOI 1999, 2001).

The effects of the AFRP's current and potential associated salmonid habitat improvement actions, considered together, are designed to at least double the salmon population levels above the average annual escapements from 1967 to 1991 (USFWS 1995). However, the historical effects of water development projects on the river have altered the natural form of the river channel and course of the waterway, and continuation of these activities, as in the past, can diminish the potential environmental gains of this and other related habitat improvement actions. Any increase in anadromous fish populations would be ecologically beneficial. The effectiveness of individual or cumulative actions would be evaluated through monitoring and evaluation processes. An "adaptive management" approach to evaluate progress and take corrective action, as necessary, would be used to select the most appropriate actions in the future.

5.1 Related Activities

Related activities aimed at salmonid production, enhancement, restoration, and mitigation are being planned and/or implemented for the Mokelumne River system. The following activities stem from directives of CVPIA legislation, CALFED ERP, State of California's anadromous fish program, Lower Mokelumne Joint Settlement Agreement, and implementation of various habitat restoration activities for the Mokelumne River system would be phased depending on available funding and landowner participation.

5.1.1 Fish Screening Program

The ongoing CVPIA fish screening program is targeted at anadromous fish entrainment reductions through screening of unscreened diversions and upgrading inadequate fish screens throughout the State. This activity is designed to reduce anadromous fish losses at water diversion sites. Reducing entrainment losses have the potential to increase populations by reducing juvenile fish mortality. Unscreened or improperly screened diversions can result in the loss or entrainment of juvenile salmonids.

5.1.2 Water Acquisition Program

The CVPIA [Sections 3406(b)(3) and (d)(2)] water acquisition program is targeted at providing level 4 water supplies and supplementing instream flows. The program acquires water from willing sellers to augment instream flows and provide level 4 supplies to refuges in the State.

5.1.3 Fish Passage

Woodbridge Dam is a flashboard dam constructed in 1910 to allow for irrigation withdrawals from the lower Mokelumne River. Until 1925 no fish passage was provided at this site and fish passage was completely dependent on seasonal flows and timing of water withdrawals. The original fish ladder that was installed in 1925 proved to be ineffective and it was replaced in

1955. The current tailwater elevation below Woodbridge Dam is too low relative to the fish ladder entrance and limits accesibility. Furthermore, attraction to the fish ladder may be hindered by low flows and spills over the dam that act to attract fish away from the ladder (USFWS 1995, 2001).

Downstream passage of juvenile salmonids has also been hindered at Woodbridge Dam and the Woodbridge Irrigation District's (WID) diversion site. In the past, flows during the emigration period for juvenile salmonids were inadequate in drier water years(USFWS 1995, 2001). Recent improvements (within the past 5 years) to the WID diversion and operations have reduced problems related to inadequate flows but they have not been completely remedied. Furthermore, based on the current arrangement of the diversion/dam complex, out-migrating salmonids are still subject to heavy predation pressure in the outflow pool if they successfully pass the complex.

5.1.4 Lower Mokelumne River Partnership

The Lower Mokelumne River Project (FERC Project No. 2916-004) Joint Settlement Agreement directed establishment of this partnership between the Service, EBMUD, and CDFG. The objectives of the partnership include: (1) protection and enhancement of the anadromous fishery; (2) protection and improvement of the Mokelumne River Ecosystem; (3) encouragement of stakeholder participation and cooperation; and (4) integration of Mokelumne River strategies with the Bay Delta Accord, CVPIA implementation, or similar measures.

6.0 ENVIRONMENTAL COMPLIANCE

The following Executive Orders and Legislative Acts have been reviewed as they apply to the Proposed Action:

National Environmental Policy Act

This EA was prepared pursuant to regulations implementing the NEPA (42 USC 4321 *et seq.*). NEPA provides a commitment that Federal agencies would consider environmental effects of their actions. This EA provides information regarding the No-Action Alternative, the Proposed Action, and their environmental impacts. If, after certain key permits are obtained and the final EA is released, the Proposed Action is found to have no significant environmental effects, a "finding of no significant impact" would be filed.

Endangered Species Act

The ESA (16 USC 1531 *et seq.*), establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the preservation of the ecosystems upon which they depend. Section 7(a) of the ESA requires Federal agencies to consult with the Service and NMFS on any activities that may affect any species under their jurisdiction that is listed as threatened or endangered, is proposed for listing, or has designated

critical habitat. An informal intra-Service section 7 consultation under the ESA within the Sacramento Fish and Wildlife Office determined that implementing the Proposed Action is not likely to adversely affect any species under their jurisdiction. The NMFS also concurred with the Service's determination that the Proposed Action is not likely to adversely affect any species under their jurisdiction.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16, USC 661 *et seq*.) provides a basic procedural framework for the orderly consideration of fish and wildlife conservation measures in Federal and Federally permitted or licensed water development projects. Whenever any water body is proposed to be controlled or modified "for any purpose whatever" by a Federal agency or by any "public or private agency" under Federal permit or license, that agency is required "first" to consult with the wildlife agency with a view to the conservation of fish and wildlife resources in connection with the project. Additionally, a report is authorized to be prepared and submitted to the action agency or applicant for Federal license or permit. The report must be made available to the Congress or other authorizing agent when decisions are made to authorize (or not to authorize, or authorize with modifications) the project. A report meeting these requirements has been prepared by the Service for this project (Appendix D).

National Historic Preservation Act (1966)

Compliance with the National Historic Preservation Act (NHPA) (16 USC 470 *et seq.*) would be necessary for the Proposed Action in areas listed, or that are eligible for listing, on the National Register for Historic Places. The Service, the Advisory Council on Historic Preservation, and the State Historic Preservation Officer, pursuant to section 800.13 of the regulations (36 CFR 800.13) implementing section 106 of the NHPA, have entered into a Programmatic Agreement to streamline the cultural resource compliance process for low impact projects. A request for cultural resource compliance was submitted to the Service's Regional Archeologist, Region 1, Portland, Oregon. The Regional Archeologist concurred that the Proposed Action does not constitute an undertaking with respect to the NHPA.

Clean Water Act and Rivers and Harbors Act

Section 404 of the Clean Water Act (33 USC 1344) requires that a Department of the Army permit be obtained from the U.S. Army Corps of Engineers (Corps) for the discharge of dredged or fill material into the "waters of the United States," including wetlands. Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) prohibits the unauthorized obstruction or alteration of any navigable waters of the United States without a permit from the Corps. The EA has described the potential effects of proposed restoration activities on wetlands and other waters. The Proposed Action would require a Nationwide Permit (NWP 27) or other permit because it might involve discharges of dredged or fill material into waters of the United States.

Floodplain Management--Executive Order 11988

Executive Order 11988 requires that all Federal agencies take action to reduce the risk of flood loss, to restore and preserve the natural and beneficial values served by floodplains, and to minimize the impact of floods on human safety, health, and welfare. The project is within the 100-year floodplain. The Proposed Action supports the preservation and enhancement of the natural and beneficial values of floodplains, and is in compliance with Executive Order 11988.

Protection of Wetlands--Executive Order 11990

Executive Order 11990 requires Federal agencies to follow avoidance, mitigation, and preservation procedures with public input before proposing new construction in wetlands. The EA has identified that the restoration actions would not result in the net loss of any wetlands. Implementation of the proposed restoration could enhance wetlands or increase their area, and is in compliance with Executive Order 11990.

Environmental Justice in Minority and Low-Income Populations--Executive Order 12898

Executive Order 12898 requires Federal agencies to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies, and activities on minority and low-income populations. The Proposed Action has considered the environmental, social, and economic impacts on minority and low-income populations and is in compliance with Executive Order 12898.

Indian Trust Assets, Indian Sacred Sites on Federal Land–Executive Order 13007, and American Indian Religious Freedom Act of 1978

These laws are designed to protect Indian Trust Assets, accommodate access and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites, and protect and preserve the observance of traditional Native American religions, respectively. The proposed restoration activities and their associated mitigation measures would not violate these protections.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) is designed to take immediate action to conserve and manage the fishery resources found off the coasts of the United States, and the anadromous species and continental shelf fishery resources of the United States. The Service has a statutory requirement under section 305(b)(4)(B) of the MSFCMA to consult with National Marine Fisheries Service with respect to any action authorized, funded, or undertaken; or proposed to be authorized, funded, or undertaken; that may adversely affect any Essential Fish Habitat (EFH) identified by MSFCMA. The Service identified measures for avoiding, mitigating, or offsetting potential impacts on EFH from the proposed restoration activities and received concurrence that the project would not adversely affect EFH.

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APPENDIX A

Federal Endangered and Threatened Species that may be Affected by Projects in the CLEMENTS 7 1/2 Minute Quad
Database Last Updated: January 29, 2009
Today's Date is: March 18, 2009

Listed Species

Invertebrates

Branchinecta lynchi - vernal pool fairy shrimp (T)
Desmocerus californicus dimorphus - valley elderberry longhorn beetle (T)
Lepidurus packardi - vernal pool tadpole shrimp (E)

Fish

Hypomesus transpacificus - delta smelt (T)
Oncorhynchus mykiss - Central Valley steelhead (T) (NMFS)
Oncorhynchus tshawytscha – Central Valley spring-run Chinook salmon (T) (NMFS)
Oncorhynchus tshawytscha - winter-run Chinook salmon (E) (NMFS)

Amphibians

Ambystoma californiense - California tiger salamander (T)
Rana aurora draytonii - California red-legged frog (T)

Reptiles

Thamnophis gigas - giant garter snake (T)

Plants

Castilleja campestris ssp. succulenta - succulent (=fleshy) owl's-clover (T)

Species of Concern

The Sacramento Fish and Wildlife Office no longer maintains a list of species of concern. The following list includes species that have been delisted within the last 5 years or are listed by the State of California as a species of concern.

Birds

Branta canadensis leucopareia - Aleutian Canada goose (D)
Buteo Swainsoni - Swainson's hawk (CA)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Grus canadensis tabida - greater sandhill crane (CA)
Haliaeetus leucocephalus – bald eagle (D)

Species with Critical Habitat Proposed or Designated in this Quad

Fish

Oncorhynchus mykiss - Central Valley steelhead (Designated)

Amphibians

Ambystoma californiense - California tiger salamander (Designated)

Key:

(E) Endangered - Listed (in the Federal Register) as being in danger of extinction.
(T) Threatened - Listed as likely to become endangered within the foreseeable future.
(NMFS) Species under the Jurisdiction of the National Marine Fisheries Service. Consult with them directly about these species.
Critical Habitat - Area essential to the conservation of a species.
(CA) Listed by the State of California but not by the Fish & Wildlife Service.
(D) Delisted - Species will be monitored for 5 years.

APPENDIX B

Lower Mokelumne River Spawning Habitat Improvement Project
Mitigation and Conservation Measures

Vegetation and Wildlife
All activities will be implemented in coordination with protection of existing habitat. All activities will be implemented during the least detrimental time of year; e.g., low streamflow periods. All activities will be completed in a timely manner. All contractors and equipment operators will be given written and oral instructions to avoid impacts and be made aware of ecological values of the site. Pre-construction field surveys will be conducted during suitable seasons by qualified personnel to identify any sensitive plants or sensitive areas (such as wetlands, riparian zones, native habitat, vernal pools, and special status species habitat) at or near the project site. Pre-construction field surveys will be conducted by qualified personnel to confirm that no sensitive terrestrial wildlife occur within one-half mile of the project site. If pre-construction surveys should identify sensitive habitats, those areas will be flagged, isolated, and avoided during the construction process. A biological monitor will be on site during construction when listed species or other sensitive fish, wildlife, or vegetation require protection. The monitor will check the site before construction each day for sensitive species; assist in avoiding impacts; determine the least damaging options for removal or transplantation of vegetation according to established protocols; and provide technical information. Existing access points will be used whenever possible in order to avoid sensitive locations. Least sensitive areas will be used for parking, construction activities, stockpiling, and staging areas, and these areas will be clearly marked and restored following construction. Unavoidable damage to wildlife habitat will be mitigated according to the Service's Mitigation Policy.

Disturbed sites will be revegetated. All planted vegetation will be with species native to, and collected in, the area, as appropriate.

When feasible, native vegetation will be salvaged from areas where ground disturbances occur, and replanted.

Vegetative planting techniques will not cause major disturbances to soils and slopes.

Fast growing willows, alders, and others species will be planted at stream edges, as appropriate, to minimize recovery time and provide shade to near-shore portions of the stream.

Excavating, filling, and other earth moving will be done in a gradual manner to allow wildlife species to escape in advance of machinery and moving materials.

Surveying and monitoring activities will be designed and conducted to minimize disturbance of wildlife and their habitat.

Fisheries and Water Quality

Instream construction activities must be minimized to reduce sedimentation.

Avoid construction during the rainy season or high flows to the degree possible. Construction should occur during the late summer low-flow season when sediment will settle out quickly.

Turbidity will be monitored to meet exceedence thresholds established by project's water quality waiver agreement with the Regional Water Quality Control Board, as applicable.

Any machinery that enters the river during work will be steam-cleaned and properly maintained to avoid water quality contamination from the release of grease, oil, petroleum products, or other nonnative materials.

Only clean gravel, washed of silt and fines will be placed into streams.

Surveying and monitoring activities will be designed and conducted to minimize disturbance of fish habitat. Should the collection of data on redds require surveyor boats, monitors will travel only downstream to minimize disturbance of salmon redds.

Sedimentation due to alterations in water control structures will be managed to minimize adverse effects on fish habitat.

Special Status Species
Giant garter snake (*Thamnophis gigas*) Giant garter snake may occur in permanently aquatic habitat or habitats seasonally flooded during the snakes active season (early-spring through mid-fall), such as marshes, sloughs, ponds, low gradient streams, irrigation and drainage canals, and rice fields. If habitat is present, a giant garter snake survey will be conducted at least six months before construction begins. If giant garter snakes are found or their habitat may be affected, consultation with the service will be required. Construction activity within giant garter snake habitat will be limited to May 1 through October 1, when the snakes are usually active. Other construction times would require additional guidance from the Service to determine if additional measures are necessary, as giant garter snakes are more susceptible to take when occupying underground burrows or crevices. The project will be surveyed for the snake 24-hours prior to construction activities, and any sightings reported to the Service. Survey of the project area will be repeated if a lapse in construction activity of two weeks or greater has occurred. Movement of heavy equipment to and from project sites, staging areas, or sediment disposal sites will be confined to existing roadways to minimize potential disturbance. The construction area will be confined to the minimum necessary for construction activities. Construction personnel will receive Service-approved worker awareness training to instruct workers to recognize the snake and its habitat. Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) The beetles primarily occur with elderberry plants (*Sambucus* spp.) in riparian habitats, although any elderberry plant with one or more stems measuring 1.0 inch or greater in diameter at ground level are considered habitat. A 100-foot buffer would be established and maintained around any elderberry shrubs containing stems measuring 1.0 inch or greater at ground level during implementation of restoration activities. The Service must be consulted before any disturbances within the buffer area are considered. If any removal of non-native vegetation is necessary within the buffer area, all work will be conducted by hand, with special care taken to avoid impacts to elderberry shrubs. The revegetation plan will include planting of additional elderberry shrubs. Vernal pool fairy shrimp (*Branchinecta lynchi*); Vernal pool tadpole shrimp (*Lepidurus packardi*) Listed vernal pool crustaceans may occur in vernal pools, vernal swales, and other seasonal wetlands that pond water for three weeks or more. Preliminary surveys to date have not identified any vernal pool habitat in the project area or access routes. If identified in pre-construction surveys, vernal pools will be surrounded with bright orange fencing to prevent disturbance. Construction activities will be avoided within 250 feet of pool margins and swale edges. Activities beyond 250 feet will be avoided if they could eventually result in adverse effects to the pools and swales through changes in

hydrology, sedimentation, or contamination of the habitat. If pools or swales cannot be avoided, the Service will be notified in writing as soon as possible, and information provided to the Service as requested.

Fleshy (succulent) owl's clover (*Castilleja campestris* ssp. *succulenta*) Habitats and conservation measures for vernal pool plant species are the same as for vernal pool crustaceans described above. Additionally, revegetation plant species will include only those that do not compete with native vernal pool plant species.

Steelhead trout (*Oncorhynchus mykiss*)
Construction activities will be timed to occur when juvenile and adult life stages are most scarce, in-migration and out-migration are at their lowest points, and spawning and incubation are not occurring. Construction occurring between June 15 and October 15 is likely to avoid direct effects to the greatest extent possible. General measures listed for Fisheries and Water Quality and Hydrology and Stream Channel will also contribute to avoidance and minimization of adverse. Riparian vegetation providing shaded riverine aquatic habitat will be protected during construction and will be mitigated if damage is unavoidable.

Delta smelt (*Hypomesus transpacificus*) Delta smelt do not occur within the watershed, however water quality downstream can be affected by significant changes in watershed hydrology, as the smelt's habitat occurs downstream. Any proposed structural or operational action will be designed to keep changes in timing and quantity of watershed flows into the San Joaquin River nil or minimal.

California tiger salamander (*Ambystoma californiense*) California tiger salamanders have been observed in the immediate vicinity. Movement of heavy equipment to and from project sites, staging areas, and sediment disposal sites will be confined to existing roadways to minimize potential disturbance. The construction area will be confined to the minimum necessary for construction activities.

Hydrology and Stream Channel

Projects will be planned and designed based on geomorphological analysis.

Work within stream channels will be minimized, to the extent possible.

Streambanks will be contoured appropriately to provide stability.

Plantings of riparian vegetation will be designed to not adversely affect groundwater hydrology or flood storage space or hinder flood flows that must be maintained to prevent flood damage.

Proposed actions will be designed to be compatible with existing flood control

systems and be coordinated with local flood control entities. Proposed actions will comply with established local flood control regulations. Erosion and sedimentation due to alterations in water control structures will be managed to minimize adverse effects on irrigation system hydrology and beneficial uses of water.
Socioeconomic Conditions
Local contractors would be hired for the construction activities to the extent practicable to benefit local economies. Revegetation plans will incorporate measures to minimize the potential for establishment and spread of noxious weeds. Noxious weeds that may become established will be controlled as necessary.
Air Quality
Construction sites will be watered to control visible dust emissions. Fume-emitting equipment will not be operated excessively near developed areas. Wet dust-producing materials to limit visible dust emissions using water. Provide at least 6 inches of freeboard space from the top of any transport container or cover the transport container Limit or promptly remove any accumulation of mud or dirt on construction equipment and vehicles at the end of each workday or once every 24 hours.
Cultural Resources
As necessary, surveys for archaeological resources will be conducted by a cultural resource specialist. Proposed projects will comply with applicable cultural resources regulations and acquire appropriate permits or clearance. If cultural sites or artifacts are discovered during construction, work will be stopped and a qualified archeologist will be consulted. The Native American Heritage Commission will be consulted if Native American artifacts are found.
Hazardous Materials
A written contingency plan will be developed for all project sites where hazardous materials (e.g., pesticides, herbicides, and petroleum products) will be used or stored. Appropriate materials and supplies (e.g., shovel, disposal containers,

absorbent materials, first aid supplies, and clean water) will be available on site to cleanup any small scale accidental hazardous spill. Hazardous spills will be reported to State and Federal authorities.
Access, Roads, and Traffic
Whenever possible, existing roads will be used to access project sites . Access agreements will be established with landowners as needed. Access to project sites will be clearly marked to avoid accidental trespass or damage to land cover. Limitations will be placed on frequency and total amount of construction traffic, and appropriate speed limits will be set to reduce dust hazards and potential for accidents. Vehicle and heavy equipment speed within construction area will be safely limited.

APPENDIX C

CALFED Mitigation Strategies Checklist

A checklist has been designed by CALFED to be used by those preparing environmental documents tiering from the CALFED PEIS/EIR (CALFED 2001). It will be used by CALFED to ensure that all environmental documents tiering from the PEIS/EIR appropriately address the issues and mitigation measures identified in the PEIS/EIR. The following checklist is the portion of the CALFED checklist applicable to the Murphy Creek Proposed Action. Inapplicable impacts and mitigation measures have been omitted in order to focus on pertinent issues.

The checklist includes a list of the impacts and programmatic mitigation strategies identified in the CALFED PEIS/EIR. The mitigation measures are derived from the impact summary tables in the PEIS/EIR and will be implemented for the Murphy Creek project, as appropriate. Some of the measures overlap with, or are the same as, those listed above, but all are compatible.

WATER QUALITY

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Releases of inorganic and organic suspended solids into the water column and turbidity resulting from increased erosion during construction, dredging, or drainage of flooded lands	7,19	Yes	Yes	7,19	
Releases of toxic substances, such as pesticides, selenium, and heavy metal residues, into the water column during construction and dredging and other Program actions.	7,19	Yes	Yes	7,19	Inapplicable measures omitted

7. Using best construction and drainage management practices to avoid transport of soils and sediments into waterways.

19. Scheduling ground-disturbing construction during the dry season.

GEOLOGY AND SOILS

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Increased construction-related short-term soil erosion, and increased	4,5,6,8,14	Yes	Yes	4,5,6,8,14	Inapplicable measures omitted

sediment deposition or soil compaction.					

4. Protecting exposed soils with mulches, geotextiles, and vegetative ground covers to the extent possible during and after project construction activities in order to minimize soil loss.

5. Implementing erosion control measures and bank stabilization projects where needed.

6. Increasing sediment deposition and providing substrate for new habitat by planting terrestrial and aquatic vegetation.

8. Re-using dredged materials to reduce or replace soil loss.

14. Preparing and implementing a water quality and soils monitoring program.

NOISE

Potentially Significant Adverse Impacts	**Mitigation Strategies**	**Applicable?**	**Discussed?**	**Mitigation Proposed**	**Notes**
Increased noise from heavy equipment operation during construction.	1,4,5,6,7,8	Yes	Yes	1,4,5,6,7,8	Inapplicable measures omitted
Increased noise from increases in traffic along major access and haul routes, and increased vehicle traffic associated with the construction labor force.	2,3,4,8	Yes	Yes	2,3,4,8	Inapplicable measures omitted

1. Using electrically powered equipment instead of internal combustion equipment where feasible.

2. Locating staging and stockpile areas, and supply and construction vehicle routes as far away from sensitive receptors as possible.

3. Establishing and enforcing construction site and haul road speed limits.

4. Restricting the use of bells, whistles, alarms, and horns to safety warning purposes.

5. Designing equipment to conform with local noise standards.

6. Locating equipment as far from sensitive receptors as possible.

7. Equipping all construction vehicles and equipment with appropriate mufflers and air inlet silencers.

8. Restricting hours of construction to periods permitted by local ordinances.

TRANSPORTATION

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Changing traffic flows as roads are temporarily rerouted around construction sites	1,3	Yes	Yes	1	Inapplicable measures omitted
Adding construction vehicles to existing traffic levels, especially on narrow, two-lane local roads with winding routes.	4	Yes	Yes	4	

1. Providing convenient and parallel detours to routes closed during construction.

4. Clearly marking roadway intersections with warnings where visibility is poor in the project vicinity.

AIR QUALITY

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Direct, short-term air pollutant emissions during construction activities.	1,2,3,6,7,8,9, 10,11,12,13	Yes	Yes	1,2,3,6,9,12	Inapplicable measures omitted
Increased fugitive emissions of wind-blown dust.	13, 6,7,8,11,12, 14 (in findings)	Yes	Yes	6,12	Inapplicable measures omitted

1. Setting traffic limits on construction vehicles.

2. Maintaining properly tuned equipment.

3. Limiting the hours of operation or amount of equipment.

6. Regular, periodic watering of construction sites to control levels of dust in the air.

9. Limiting vehicle idling time.

12. Implementing construction practices that reduce generation of particulate matter.

AQUATIC AND FISHERY RESOURCES

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Potential short-term disturbance of existing biological communities and species habitat, mobilized sediments, and input contaminants from construction activities.	1,2, 10 (in findings)	Yes	Yes	1,2	Inapplicable measures omitted

1. Implementing BMPs, including a stormwater pollution prevention plan, toxic materials control and spill response plan, and vegetation protection plan.

2. Limiting construction activities to windows of minimal species vulnerability.

VEGETATION AND WILDLIFE RESOURCES

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Temporary or permanent loss or degradation of wetland and riparian communities.	1,2,3,4,5,13, 14 (in findings), 15	Yes	Yes	1,4,5	No. 1 to extent practicable; Inapplicable measures omitted
Temporary or permanent loss of habitat or direct impacts on special-status species.)	1,2,3,4,5,9, 10,11,14, 15 (in findings	Yes	Yes	1,4,5,9	No. 9 to extent practicable; Inapplicable measures omitted

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Temporary disturbance or mortality of special-status species due to construction and habitat management activities.	1,4,12 (in findings),14	Yes	Yes	1,4,12	

1. Avoiding direct or indirect disturbance to wetland and riparian communities, special-status species habitat, rare natural communities, significant natural areas, or other sensitive habitat.

4. Restoring wetland and riparian communities, special-status species habitat, and wildlife use areas temporarily disturbed by on-site construction activities immediately following construction.

5. Phasing the implementation of Ecosystem Restoration Program habitat restoration to offset temporary habitat losses and to restore habitat (including special-status species habitat) before, or at the same time that, project impacts associated with the Ecosystem Restoration Program are incurred.

9. Avoiding construction or maintenance activities within or near habitat areas occupied by special-status wildlife species or in important wildlife use areas when species may be sensitive to disturbance.

12. Implementing BMPs.

FLOOD CONTROL

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Increased flood stages along streams due to increases in the roughness of the stream channel from vegetation on stream banks.	4	Yes	Yes	4	

Incorporating flood control criteria into the design of stream bank revegetation projects. For example, by increasing the width of vegetated sections to maintain conveyance capacity, the net effect of vegetation on flood control would be negligible.

CULTURAL RESOURCES

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Impacts on cultural resources from ground-disturbing activities.	1-9,11	Yes	Yes	1	Inapplicable measures omitted
Impacts on cultural resources from new construction, excavation, or fill.	1-9, 11	Yes	Yes	1	Inapplicable measures omitted
Impacts on cultural resources from alteration of existing facilities.	1,7,10	Yes	Yes	1	Inapplicable measures omitted

1. Conducting cultural resource inventories.

PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS

Potentially Significant Adverse Impacts	Mitigation Strategies	Applicable?	Discussed?	Mitigation Proposed	Notes
Increased risk of groundwater and surface water contamination from naturally occurring or spilled hazardous materials and from improper handling of hazardous materials.	6	Yes	Yes	6	

6. Following established and proper procedures and regulations for removing and disposing of contaminated materials.

CALFED (CALFED Bay-Delta Program). 2001. CALFED Bay-Delta Program guide to regulatory compliance for implementing CALFED actions. Vol. 1. General guidance. November, 2001. Available from Calif. Dept. Water Resources, Sacramento, CA.

Appendix D

United States Department of the Interior

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

In reply refer to:

Memorandum

To: Assistant Regional Director, Water and Fishery Resources
Sacramento, California

From: Chief, CVPIA Project Implementation Division,
Sacramento, California

Subject: Fish and Wildlife Coordination Act Report for Funding the Lower Mokelumne River Spawning Habitat Improvement Project, San Joaquin County, California

This memorandum constitutes the U.S. Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act (FWCA) report, as provided for in section 2(b) of the FWCA (Public Law 85-624; 16 U.S.C. 661-667e), regarding proposed funding for restoration of anadromous fisheries habitat in the lower Mokelumne River, San Joaquin County, California. The Service proposes to grant funds to the East Bay Municipal Utility District to conduct the next phase of an ongoing long-term effort to infuse the lower reaches of the Mokelumne River with coarse sediment to improve anadromous fish spawning habitat in a 1-mile reach of the river immediately downstream of Camanche Dam.

One of the main salmonid habitat deficiencies in the Mokelumne River is lack of suitable gravel for reproduction and juvenile rearing. Downstream of Camanche Dam, the river's floodplain and channel were extensively mined for sand and gravel for construction aggregate and gold extraction. Reduction in flows and associated reduction in sediment transport in the lower Mokelumne River have further modified the river's geomorphic and hydrological processes, resulting in limited gravel recruitment and sediment transport. The remaining gravel is immobile and susceptible to compaction and armoring; rendering it unavailable for salmon production.

The proposed action would provide additional Chinook salmon and Central Valley steelhead spawning gravel and improve inter-gravel water quality (i.e., the conditions between gravel particles that are conducive to spawning success). Over the 5-year period of the proposed spawning gravel project, cumulatively, about 6,000 to 12,000 cubic yards of gravel would be added to the five selected sites in the areas identified as needing spawning gravel restoration. The proposed Lower Mokelumne River Spawning Habitat Improvement Project would be partially funded by the Anadromous Fish Restoration Program (AFRP) which is authorized under section 3406(b)(1) of the Central Valley Project Improvement Act. The AFRP's goal is to "... implement a program that makes all reasonable efforts to ensure, that by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991."

As the Federal lead agency for implementing the proposed funding action, the Service has assessed environmental effects of the proposed action, as outlined in the FWCA. Given the following considerations, we find no need to provide additional recommendations:

- Measures incorporated into the proposed spawning habitat improvement project's activities described in the Environmental Assessment to prevent loss or damage to, and provide development and improvement of, fish and wildlife resources are adequate;

- Section 7 consultation under the Endangered Species Act of 1973, as amended, for implementing the proposed action's habitat restoration and enhancement concluded with concurrence from the Service and the National Marine Fisheries Service that listed species and designated critical habitat are not likely to be adversely affected.

If you have any questions regarding this report or other aspects of the FWCA, please contact Donald Ratcliff of my staff at (209) 334-2968 x409.