DEPARTMENT OF THE ARMY
SOUTH PACIFIC DIVISION, U.S. ARMY CORPS OF ENGINEERS
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CESPD-RP-S (1105)

SEP 21 2004

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers (CEMP-SPD), 441 G Street, N.W., Washington, DC 20314-1000

SUBJECT: Transmittal of Final Feasibility Report for Matilija Dam Ecosystem Restoration Feasibility Study, Ventura County, California (PWI #013667)

1. Reference, memorandum, CESPL-DE, dated 16 September 2004, SAB.

2. I concur in the conclusions and recommendations of the District Commander.

JOSEPH SCHROEDEL
BG, USA
Commanding

EXECUTIVE SUMMARY

The Matilija Dam Ecosystem Restoration Feasibility Study is one of the largest dam removal studies in the country, and one of the largest ecosystem restoration studies undertaken by the Army Corps of Engineers west of the Mississippi River.

This report presents the findings of the alternatives analysis and the selection of a recommended plan for the Matilija Dam Ecosystem Restoration Feasibility Study, an effort conducted and coordinated by the Army Corps of Engineers, Los Angeles District, and the Ventura County Watershed Protection District (VCWPD). Many federal, state and local government agencies; environmental resource agencies; interest groups and other stakeholders have provided valuable contributions to the evaluation process that resulted in this report.

The study focuses on ecosystem restoration in the Ventura River Watershed to benefit native fish and wildlife (including the federally listed endangered southern steelhead trout) of the Ventura River and Matilija Creek in the vicinity of Matilija Dam, and improvement to the natural hydrologic and sediment transport regime to support coastal beach sand replenishment from the Ventura River.

Baseline Conditions

Construction of the 190-foot high Matilija Dam was completed in 1947 by the Ventura County Flood Control District (presently VCWPD) to provide water storage for agricultural needs and limited flood control. The dam is currently operated by the Casitas Municipal Water District (CMWD) per a 50-year agreement (1959- 2009). This concrete arch dam is located about 16 miles from the Pacific Ocean and just over half a mile upstream from the Matilija Creek confluence with the Ventura River.

Problems associated with the dam became evident within a couple of decades after construction and include: large volumes of sediment deposited behind the dam and the loss of the majority of the water supply function and designed flood control capability; the deteriorating condition of the dam; the non-functional fish ladder and overall obstruction to migratory fishes; the loss of riparian and wildlife corridors between the Ventura River and Matilija Creek; and the loss of sediment transport contributions from upstream of the dam, with resulting erosion to downstream reaches of the Ventura River, the estuary and the sand-starved beaches along the Ventura County shoreline.

Sedimentation behind the dam has rapidly reduced the ability to store a significant amount of water for future use. It is estimated that approximately 6 million cubic yards of sediments (silts, sands, gravels, cobbles and boulders) have accumulated behind the dam. A relatively small and shallow lake remains behind the dam, presently estimated to be about 500 acre-feet or seven percent (7%) of the original capacity. This lake is expected to disappear by approximately year 2020 as sedimentation continues. Currently Matilija Dam is subject to overtopping during storm flows. The flows however carry mostly suspended fine sediments; the coarser sediments remain trapped behind the dam. By approximately year 2040, the reservoir basin is expected to have reached an equilibrium condition and be completely filled with sediment totaling over 9 million cubic yards. Once this has occurred, full sediment loads from the subwatershed upstream of the dam will be transported downstream.

Ecosystem Concerns

The Ventura River Watershed provides important riparian and wetland habitat for a wide variety of native wildlife species, including many sensitive species and several threatened and endangered species.

Matilija Dam has had many adverse effects on stream ecology and wildlife over the last 55 years. Sediment trapped by the dam has deprived downstream reaches of sand and gravel sized materials necessary to sustain a suitable substrate for spawning, including the creation of riffle and pool formations, sandbars, and secondary channels. These conditions help promote habitat diversity capable of supporting many sensitive wildlife species such as the southern steelhead, southwestern pond turtle, the arroyo toad and the California red-legged frog. The dam has blocked upper watershed natural river flows and therefore has altered natural stream and habitat dynamics. Water that has been impounded and subsequently released downstream is typically of poorer quality, affected by higher temperature, lower dissolved oxygen, and potentially higher nutrient loads. The cumulative adverse effects of Matilija Dam on downstream ecology will continue for at least 100 years, long after the reservoir is completely filled with sediment.

Historically southern steelhead, a species of migratory trout, were common inhabitants of California coastal streams as far south as San Diego. In the last 50 years there has been a dramatic decline from historic estimates of returning adults. This decline has been attributed in large measure to the numerous dams and diversions that have blocked steelhead access into historic habitat in the tributaries of major river systems, and the degradation to quality of habitat in rivers due to agricultural influence and urbanization. In 1997, the southern steelhead was listed as federally endangered. The Ventura River system once supported approximately 4,000 to 5,000 spawning southern steelhead. Current population estimates are less than 100 adult individuals for the Ventura River system. The steelhead habitat upstream from Matilija Dam was historically the most productive spawning and rearing habitat in the Ventura River system. It is estimated that about fifty percent (50%) of this remaining prime habitat was lost due to the construction of the dam.

This study evaluates and recommends the removal of Matilija Dam, an action that would provide an historic restoration opportunity for the Ventura River ecosystem and steelhead fishery. With the removal of the dam, steelhead and other aquatic species (fish, including the Arroyo chub- a California State species of special concern, and amphibians) would regain access to approximately 17.3 river miles of high quality spawning and rearing habitat. Without removal of the dam, fish passage cannot be restored as even a fish ladder facility could not provide a viable solution for a dam of this size.

Another physical barrier to fish passage along the Ventura River is the Robles Diversion Dam (owned by the Bureau of Reclamation and leased to CMWD), less than two miles downstream of Matilija Dam. This facility diverts water from the Ventura River to Lake Casitas, the remaining significant surface water supply for the Ventura River Watershed and surrounding areas. This diversion dam has impacted steelhead migration, spawning and rearing throughout the lower Ventura River. The restoration of fish passage at the facility has been pursued by CMWD. A fishway is currently under construction and will be completed in 2005. New operating criteria as established by the Biological Opinion (NOAA, 2003) will increase the current downstream releases of 20 ft^3/sec from the diversion dam to approximately 50 ft^3/sec for a specified period after storm events to provide minimum flows for steelhead passage at Casitas Springs/Foster Park, where surface flows are prone to disruption as a result of water extraction operations.

Matilija Dam has contributed to streambed erosion in the riverine system. Where erosion of the streambed has been most severe and the active channel has become entrenched, the adjacent alluvial deposits in the floodplain are now abandoned. Flood flows up to the 100-year event can remain in the main channel and do not inundate the floodplain. Native habitats dependent on an active floodplain as a result are significantly impacted and drastically altered. The greatest influence of Matilija Dam to riverine sediment supply and transport are within the 8.5 river miles between the structure and San Antonio Creek. In this stretch of the river, the majority of sediment supply is from the North Fork Matilija Creek. Without the dam in place however, Matilja Creek would be the largest sediment contributor in these reaches. Immediately downstream of Matilija Dam, about 4 feet of erosion has occurred since 1971. Bedrock control limits the amount of erosion. In the reach downstream of Robles Diversion Dam, there has been up to 10 feet of erosion, as there is detention of sediment at that facility. However, if Matilija Dam were removed, degradation would not be a significant problem in this reach. Downstream of San Antonio Creek, a reach between river mile 2 and 5.5 (measured from the river mouth) has experienced up to 10 feet of erosion. This is attributed to a combination of sediment supply deficits resulting from the presence of Casitas Dam and Matilija Dam, as well as debris basins in San Antonio Creek watershed, and channel constriction by bridges.

Beach erosion, attributed to the influence of human activities including the construction of dams, has also been a problem along most of the local coastline. Over the last 50 years, Emma Wood State Beach, west of the mouth of the Ventura River, has eroded approximately 150 feet, indicating an erosion rate of 2 to 3 ft/yr. Surfer's Point just downcoast of the river mouth, once a sandy beach, is now mostly cobble. Loss of upper sand beach zones has caused a loss of spawning habitat for the California grunion, and to foraging and breeding habitat for the federally listed threatened western snowy plover. The extent of coastal dunes on both sides of the river mouth has been diminishing over the years as a result of the loss of protective beachfront and erosion by wave action. Coastal dunes and their habitats, which once supported the silvery legless lizard, a California-State species of special concern, are diminishing and will eventually be lost entirely.

The overtaking of native riparian habitat by invasive and exotic species however has been problematic in the watershed. Giant reed (*Arundo donax*) has become the dominant vegetation type within significant portions of the reservoir basin, and is continuing to spread into the remaining areas, including some portions of Matilija Creek riparian habitat upstream of the reservoir basin. This plant out-competes and displaces the native vegetation and seriously degrades the habitat quality of the area. Giant reed provides no food for wildlife, and at best, very poor habitat for some nesting birds or shelter/shade for native amphibians. Without an intensive removal program, giant reed and other exotic plant species will diminish the ability of the Ventura River to support sensitive species that rely on native willow, cottonwood, and other native riparian species. These include resident and migratory birds, such as least Bell's vireo and southwestern willow flycatcher. The reservoir basin acts as a source of giant reed propagules for the lower watershed as these materials are washed downstream during significant storm events. Downstream of Matilija Dam, clumps of giant reed have colonized in parts of the floodplain within the Ventura River. With time, these clumps will begin to spread, significantly reducing the value of riparian habitat and in turn the native species that depend on that habitat.

Water Supply and Water Quality Concerns

The natural streamflow in the Ventura River and associated subsurface alluvial groundwater is impacted by several major water extraction operations in the watershed: Matilija Dam, Casitas Dam, Robles Diversion Dam, Foster Park diversion facility and other smaller water extractors. Annually the extraction operations in the Ventura River mainstem are approximately 18,000 ac-ft (NOAA, 2003). Matilija Dam provides an average of 590 ac-ft/yr (Reclamation, 2003) to Robles Diversion Dam. The effects of these extractions limit the duration and magnitude of river flow necessary for successful steelhead migration, and in addition, adversely affect in-stream habitat characteristics. During the summer/fall period when natural flows are low, fish and aquatic organisms that become isolated as a result of receding stream flows are subjected to predation, impaired water quality, and desiccation once flows cease.

Discharges into the Ventura River, including point source contributions from a wastewater treatment facility, and non-point source contributions from agricultural and urban development have affected the water quality of the river. The California Regional Water Quality Control Board has classified the Ventura River as a Category I (impaired) watershed and has approved the river's status on the 303(d) list and TMDL priority schedule for pollutants including DDT, copper, silver, zinc, algae (eutrophication) and trash.

Flow Conditions

Although Matilija Dam has a negligible impact on peak flows of large events (greater than 10-yr return periods), it can attenuate the more typically occurring moderate-sized storms, as CMWD can draw down the existing reservoir at the dam prior to the winter storm season. In conjunction, Robles diversion facility, though limited in effective storage capacity, can divert up to 500 ft^3/sec to Lake Casitas. These reductions in peak flows adversely impact steelhead and their habitat in the Ventura River (NOAA, 2003). Steelhead depend on peak flows to attract the fish to enter the river and migrate upstream. The migration is facilitated by the higher flows as natural stream barriers become alleviated. The peak flows flush out finer sediments that may overlay spawning gravels as well as provide a new source of spawning sediment. Additionally, peak flows remove algae and assist in naturally thinning less-established riparian vegetation, including annual types. As a result, well-established perennial species would have less competition for soil nutrients and water allowing mature and more shady habitat to flourish.

The removal of Matilija Dam would effectively cease all peak flow attenuation. Even though a similar situation would inevitably occur under future without project conditions, the benefit would not be available until after year 2040.

Alternatives

A full array of structural and non-structural measures were formulated to address identified problems and opportunities, including measures related to dam removal, no dam removal, mechanical and natural sediment transport, stabilization of deposited sediments, levee and bridge modifications, protection of existing water supply facilities, recreation, and exotic and invasive species management. These measures were combined to formulate, evaluate, and compare alternative plans to each other. Screening criteria was used to select a recommended plan.

The plan formulation process resulted in a final array of seven alternatives: six action alternatives and the No Action plan. Criteria used in the evaluation include impacts related to sediment deposition and turbidity, flooding, beach nourishment, changes to the dam site topography, biological and cultural resources, water supply, and air quality noise and traffic. Features common to each alternative include removal of Matilija Dam; restoration of fish passage; reestablishment of natural hydrologic and sediment transport processes from the upper Matilija Creek watershed; management of the sediment trapped behind the dam; removal of exotic and invasive species, particularly giant reed (Arundo donax) from the reservoir basin, upstream of the basin, and in the downstream reaches of the Ventura River, and non-native predatory species from the dam lake and immediately downstream of the dam, particularly largemouth bass, sunfish, catfish and bull frogs; and mitigation measures for impacts to flooding and to water supply. Recreation measures include trails and associated facilities.

The No Action alternative assumes that the dam will remain in-place for the future 50-year period of analysis. The dam will be monitored for safety purposes, but no modifications to the structure are assumed to be necessary. An additional 3 million cubic yards of sediment will accumulate behind the dam over the next 35 years, resulting in about 9 million cubic yards of sediment trapped behind the dam by 2038. The existing reservoir (lake) will disappear by 2020. Downstream sediment transport will be restored after the in-filling of the dam reservoir basin, although downstream sediment aggradation will take about 100 years before pre-dam streambed elevations are restored. Downstream water diversion operations may be adversely affected due to increased sedimentation at the Robles Diversion Dam. Giant reed (Arundo donax) will continue to overtake existing native species. Casitas Municipal Water District will restore fish passage above Robles Diversion Dam with the anticipated completion of the fishway, although steelhead will not have access to prime spawning and juvenile rearing habitat above Matilija Dam. No maintained recreation trails will exist around Matilija Dam.

Alternative 1 is full dam removal in one phase and mechanical removal of the trapped sediment. The marketable portion of the trapped sediment (3.0 million cubic yards) is processed and sold on-site as aggregate. The portion that is not marketable, comprised of fine-grained sediment approximately underlying the limits of the existing lake (2.1 million cubic yards), is slurried downstream to a 118-acre disposal site located in the vicinity of the Highway 150 Bridge prior to removal of the dam. Additional fine-grained residual sediment remaining after the completion of the aggregate processing operation (770,000 cubic yards) will be trucked to the same disposal site. To convey creek flows and to protect the aggregate operation, a 60-foot wide channel (base width) will be constructed along the right side (looking downstream) of the reservoir basin. The bottom of the channel would be similar to the pre-dam channel bottom to allow natural gradients easily accessible by fish. The channel would be protected on the left side (looking downstream) with soil cement along the side slope extending 13 feet above the channel bottom and 5 feet below. The channel capacity would contain a 100-yr storm event. The soil cement, constructed utilizing on-site aggregate, will be removed following completion of the aggregate sale operation.

Alternative 2a is full dam removal in one phase and natural (fluvial) transport of a portion of trapped sediment. The fine sediment deposited beneath the existing lake (2.1 million cubic yards), is slurried downstream to a 118-acre disposal site located in the vicinity of the Highway 150 Bridge prior to removal of the dam. The remainder of the trapped sediment is allowed to be eroded downstream by storm events and natural fluvial processes. To convey flows, a shallow pilot channel not exceeding 10 feet deep would be excavated through the reservoir basin

Alternative 2b is full dam removal in one phase and natural (fluvial) transport of all of the trapped sediment. The trapped sediment is allowed to be eroded downstream by storm events and natural fluvial processes. To convey flows, a shallow pilot channel not exceeding 10 feet deep would be excavated through the reservoir basin.

Alternative 3a is incremental removal of the dam and natural (fluvial) transport of a portion of trapped sediment. The dam demolition will be conducted in two phases. In Phase 1, the fine sediment deposited beneath the existing lake (2.1 million cubic yards) is slurried downstream to a 118-acre disposal site located in the vicinity of the Highway 150 Bridge, followed by the removal of the dam structure to elevation 1000. To convey flows, a shallow pilot channel (not exceeding 10 feet deep) would be excavated through the reservoir basin. Phase 2 removal of the remaining portion of the dam will begin once the sediment level in the reservoir has, by natural fluvial erosion, reached an equilibrium condition with the modified dam height resulting from Phase 1.

Alternative 3b is incremental removal of the dam and natural (fluvial) transport of all of the trapped sediment. The dam demolition will be conducted in two phases. In Phase 1, the dam is removed to elevation 1030. All materials excavated for the removal of this portion of the dam are placed upstream in the reservoir basin. To convey flows, a shallow pilot channel not exceeding 10 feet deep would be excavated through the reservoir basin. Phase 2 removal of the remaining portion of the dam will begin once the sediment level in the reservoir has reached an equilibrium condition with the modified dam height resulting from Phase 1.

Alternative 4a is full dam removal in one phase and long-term storage of a portion of the trapped sediment within the reservoir basin. The fine sediment deposited beneath the existing lake (2.1 million cubic yards), is slurried downstream to a 118-acre disposal site located in the vicinity of the Highway 150 Bridge prior to removal of the dam. A 100-foot wide channel (base width), following a pre-dam alignment, is excavated in the reservoir basin to an elevation similar to pre-dam levels. The channel, lined with riprap stone protected side slopes extending 11 feet above channel bottom and 5 feet below, will have a design capacity to convey the 100-year flood event. Excavated materials will be permanently stockpiled in storage areas located within the reservoir basin.

Alternative 4b is full dam removal in one phase and short-term storage of a portion of the trapped sediment within the reservoir basin. The fine sediment deposited beneath the existing lake (2.1 million cubic yards), is slurried downstream to a 118-acre disposal site located in the vicinity of the Highway 150 Bridge prior to removal of the dam. A 100-foot wide channel (base width), with a pre-dam alignment, is excavated through the reservoir basin to the pre-dam invert (streambed) elevation. The channel side slopes in the lower half of the reservoir basin would be lined with soil cement, approximately 7 feet high. The revetment height would be overtopped by flows exceeding 12,500 ft^3/sec (10-yr storm event). Excavated materials are stockpiled in storage areas located within the reservoir basin. Soil cement revetment would offer a higher level of protection in portions of the basin where trapped sediment, or the adjacent stockpiled sediment, contain more fines content. All soil cement would be removed from the site following sufficient removal by erosion of the trapped sediment. The removal would be performed in stages.

Comparison and Evaluation of Alternative Plans

Removal of Matilija Dam would cause erosional trends in the Ventura River to reverse and become depositional trends, and finally a balanced condition (equilibrium) to occur. The deposition would re-create a riverine morphology, in terms of channel and riverbed materials characteristics, more similar to pre-dam conditions. The time to reach equilibrium is different for the alternatives. Alternatives 1 and 4a would reach equilibrium in 50 years, while Alternatives 2a, 2b, 3a, 3b within 10 years, and Alternative 4b within approximately 20 years. For the future without-project conditions (No Action Alternative), equilibrium would occur within approximately 100 years. Erosional trends are still likely to continue, though at a slower rate depending on the action alternative, between river mile 5 and 3. The main cause for this is channel constriction by bridges and the presence of Casitas Dam and San Antonio Creek Watershed debris basins.

Sediment delivery to the ocean, and resulting benefits to beach nourishment, would occur sooner for the action alternatives as compared to the No Action Alternative. Time frames would be similar as those described for the establishment of riverine equilibrium. Over a period of 50 years, increases in sediment delivery volumes would be approximately one-third greater than the No Action Alternative for sand, gravel, and cobble-sized sediment. The Beach Erosion Authority for Control Operations and Nourishment (BEACON) has estimated that a cubic yard of sand roughly equates to a square foot of dry sand on the beach. Detrimental effects related to the restoration of increased sediment transport to the shoreline include the short-term impacts of fine sediments on local crustaceans, and the potential increase in future dredging at the Ventura and Channel Islands Harbors due to longshore transport of increased sediments from the Ventura River. Since the increase in volumes of fines and sands are relatively small when compared to the No Action Plan, the detrimental impacts are not considered significant for this study.

The associated effects of releasing trapped sediment downstream, i.e. increased riverine sediment deposition and turbidity levels, will cause short-term adverse impacts to riparian communities, aquatic wildlife and habitats. The impacts however are considered beneficial overall since the system would recover with time.

The process of returning the river to pre-dam conditions will increase the flood risk to infrastructure that has developed along the river corridor since the construction of the dam. As a result, flood control improvements are necessary. Alternatives 2a, 2b, 3a, 3b, and 4b will require more flood protection (“higher level”) than Alternatives 1 and 4a (“lower level”) since trapped sediments from the dam will be released downstream. Both levels of protection assume purchase of the Matilija Hot Springs property, purchase and removal of Camino Cielo structures, removal and replacement of the Camino Cielo Bridge and restoration of the channel width at the current location, and extension of the Santa Ana Bridge with local channel widening. Improvements also include constructing new and raising existing levees and floodwalls. Locations will include Meiners Oaks (up to 3 feet maximum above the river bank for the “lower level” and 5 feet for “higher level”), Live Oak Acres (up to 2 feet maximum above the existing levee for the “lower level” and 6 feet for “higher level”) and Casitas Springs (up to 2.5 feet maximum above the existing levee for the “lower level” and 5 feet for “higher level”). The levee and floodwall at Meiners Oaks will be new features. The source for earth fill materials for the levees is assumed to be from Matilija Dam reservoir basin.

Impacts to water supply due to elevated sediment levels (both coarse- and fine-grained) at the Robles Diversion Dam and Foster Park would require some mitigation. At the Robles diversion facility, a sediment bypass (consisting of four radial gates) would be constructed at the existing sediment basin to allow increased sediment loads to be flushed downstream of the facility. This would be required for all of the action alternatives. The radial gate system would allow for diversion operations to be maintained at a wider range of river flows. Additional modifications would also be necessary to the existing weir (timber crib) structure.

For two of the alternatives (2b,3b), even with a high-flow sediment bypass in place, the impacts from fine sediment in the initial years (and potentially longer in case of a drought period) would overwhelm the facility by clogging the fish screen in the diversion canal and causing operations to cease for the respective season while maintenance cleanout could be performed. These alternatives would necessitate replenishment of the losses to Lake Casitas safe yield by purchase of replacement water from an outside purveyor.

For Alternative 2a and 3a, it is expected that turbidity impacts at Lake Casitas will likely result in water quality problems including prolonged duration of algal bloom production and potential increases in water treatment efforts. Because of the uncertainties related to level and duration of impacts, especially in a drought scenario (where low flows could still transport turbid loads), a desilting basin to settle out fines prior to conveyance to Lake Casitas would be included.

For Alternative 4b, turbidity impacts at Robles Diversion Dam are expected to be much less than Alternative 2a or 3a due to the presence of channel protection (soil cement revetment) in a portion of the reservoir basin where sediments contain higher levels of fines. The soil cement revetment will assure that flow levels less than the 10-year event will not allow erosion of the protected finer materials. Turbidity levels associated with these levels of flow events would therefore be similar to existing conditions. Even during a drought situation, turbidity levels would not be aggravated. For flow events larger than the 10-year event, the soil cement revetment would be overtopped, and flows would have access and cause erosion of the finer materials. The increase in turbidity levels would be of limited duration and would likely be within the natural variability of existing conditions levels. Eventual staged removal of the revetment will cause increases in turbidity levels to possibly higher limits for a temporary period. The removal time frame would be based on monitoring and adaptive management and would not coincide in periods of on-going drought when Lake Casitas levels would be lower than normal.

For Alternative 4b, as part of a locally preferred betterment, a desilting basin has been included. At Foster Park, two additional groundwater wells would be constructed to offset the losses from interruption of surface water diversion operations when turbidity levels are above the maximum limit of 10 NTU. The wells would only be necessary for Alternatives 2a, 2b, 3a, 3b and 4b. At this time, the wells are also included for Alternatives 1 and 4a due to the susceptibility to erosion and loss of fines associated with one of the slurry disposal areas.

Alternative 1 has the highest impacts to the community in terms of truck traffic resulting from aggregate sale operations.

Selection of the Recommended Plan

NER Plan

The table below presents the benefits and costs associated with the action alternatives.

The benefits associated with the alternatives are presented in non-monetary terms (Habitat Units). Ecosystem restoration benefits for this study have been prepared using a modified HEP analysis. The Average Annual Habitat Units (AAHU) have been computed over a 50-year period. Alternative 4b provides the most net benefits to the ecosystem based on the HEP analysis with an overall increase of 731 AAHU when compared to the baseline conditions (No Action Alternative). The outputs for Alternative 2a, 2b, 3a, and 3b however are in a relatively close second position with benefits of 678 AAHU. There is a more distinct separation with the next lower value associated with Alternative 1 (609 AAHU), followed by Alternative 4a (554 AAHU).

Costs shown for the alternatives in the table below do not include recreation measures or betterments under the locally preferred plan.

Alternative 4b has the lowest average annual cost per AAHU. From a cost effectiveness perspective, an alternative is cost effective if there are no other alternatives that provide the same output at a lower cost. Therefore Alternative 4b is the most cost effective alternative. An incremental cost analysis is not necessary since there are no changes in output levels to be compared and levels to be selected except for the No Action Alternative. It is recommended that Alternative 4b be considered as the NER plan.

Locally Preferred Plan

In a consensus decision, the Sponsor and the majority of the stakeholder participants of the Plan Formulation Group have identified Alternative 4b as the preferred plan. In addition however to the NER plan, a desilting basin will be included as an additional feature to Alternative 4b. The desilting basin is considered an associated feature with costs completely borne by the Sponsor.

Recommended Plan

Since the completion of the Public Draft Report, costs have been updated to reflect technical review comments. In particular, cost estimates for the levees at Meiners Oaks, Live Oak and Casitas Springs have been revised based on further review of the necessary fill quantities for the structures. This increase in levee costs does not affect the selection of the Recommended Plan. The table below remains valid for screening purposes.

Alternative 4b with the addition of a desilting basin as an associated feature has been chosen as the recommended plan. The total project cost is $123,7700,000. This includes recreation costs ($1,000,000) and the betterment feature (desilting basin) at the Robles diversion facility ($5,700,000). The total habitat area that would be restored is 2,814 acres.

The efforts for the Matilija Dam Ecosystem Restoration Recommended Plan encompass a watershed scale and would restore essential physical and natural processes responsible for creating and sustaining habitats and ecosystem functions that support a wide variety of native species, including listed species. The Plan would also benefit current weak stocks of southern steelhead by providing the species access to historically high quality spawning and rearing steelhead habitat.

ALTERNATIVES SCREENING TABLE: ECONOMIC OUTPUTS (FY 2004 Price Levels)							
	Alt. No. 1	Alt. No. 2A	Alt. No. 2B	Alt. No. 3A	Alt. No. 3B	Alt. No. 4A	Alt. No. 4B
Average Annual Habitat Units (AAHU)	2002	2071	2071	2071	2071	1947	2124
Gains beyond No Action[1] (AAHU)	609	678	678	678	678	554	731
Gross Project Costs							
First Costs	$98,879,834	$92,554,052	$114,026,494	$96,807,677	$115,298,299	$97,563,070	$92,088,077
Interest During Construction (Phase 1 only)	$5,376,043	$5,032,113	$6,199,558	$5,101,088	$5,961,246	$8,223,981	$5,006,779
Phase 2 Adjustment for Alt.3 Const. to base year				-$251,618	-$391,290		
Monitoring and Adaptive Management	$4,943,992	$4,627,703	$5,701,325	$4,840,384	$5,764,915	$4,878,153	$4,604,404
Cultural Resources	$988,798	$925,541	1,140,265	$968,077	$1,152,983	$975,631	$920,881
Total Gross Investment[2]	$110,188,667	$103,139,409	$127,067,641	$107,465,608	$127,786,153	$111,640,835	$102,620,140
Annual Costs							
Annual Cost of Total Gross Investment	$6,627,674	$6,203,672	$7,642,917	$6,463,886	$7,686,135	$6,715,019	$6,172,439
Annual Cost of Maintenance (O&M)	$289,265	$433,256	$319,910	$436,483	$319,526	$283,785	$325,594
Total Annual Costs (AAC)	$6,916,938	$6,636,928	$7,962,827	$6,900,369	$8,005,660	$6,998,805	$6,498,033
IV. Average Annual cost per AAHU	**$11,357.86**	**$9,788.98**	**$11,744.58**	**$10,177.54**	**$11,807.76**	**$12,633.22**	**$8,889.24**

[1]No Action Alternative has 1393 AAHU.
[2]Total Gross Investment does not include recreation costs (all alternatives) and betterment costs for desilting basin (Alternative 4b).